SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. L.—No. 12. [NEW SERIES.] NEW YORK, MARCH 22, 1884. [$3.20 per Annum. [POSTAGE PREPAID.]

THE NEW ELECTRIC LIGHT AT HELL GATE LIGHTHOUSE.

The passage through Hell Gate, connecting Long Island Sound with the East River, has always been dangerous, the tides producing swift and powerful currents which were changed by the rocks both in and bordering the channel into treacherous whirlpools and eddies. For nearly fifteen years the work of removing these rocks has been carried on, and although not yet completed it has resulted in increasing the depth and width of the channel and lessening the risks encountered by vessels. The most formidable obstruction yet to be removed is Flood Rock, upon which work is so far advanced as to need but another appropriation to finish. Each operation connected with this great undertaking we illustrated and described during its progress.

As a needed supplement to this work, the Light House Board is now erecting, under the immediate supervision of General J. C. Duane, an iron light house that will not only illumine Hell Gate proper, but will light miles of the approach on each side. The structure will jut out from the shore at Astoria, one corner of it being at the extreme point

(*Continued on page* 178.)

THE NEW ELECTRIC LIGHT NOW IN PROCESS OF ERECTION AT HELL GATE, NEW YORK CITY.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, MARCH 22, 1884.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 429,

For the Week ending March 22, 1884.

Price 10 cents. For sale by all newsdealers.

THE PLOT AGAINST PATENTS.

For several weeks past we have been calling the attention of our readers to the remarkable series of bills introduced in Congress for the purpose of breaking down the patent laws, and also to the extraordinary attitude exhibited in the House of Representatives in respect to patents, by the passage of two of these bills by immense majorities. Such of the newspapers as share in the Congressional feeling of hostility to the holders of patents are found to be owned or controlled by railway officials.

The general, all-pervading impression among the people is that nothing has so greatly contributed to the prosperity of the nation as our excellent system of patent laws. How it is that Congress, at this late day, has been brought around into its present hostile attitude appears to most persons unaccountable. It has been accomplished, in all probability, by a very cunning and adroit system of operations pursued by the combined railroad companies. The aggregate amount which they are annually obliged to pay to the inventors and patentees of new inventions rises to hundreds of thousands of dollars every year; and naturally they reason that, if by hook or crook they could nullify the patent laws, their profits would be increased and great annoyances overcome. For a number of years they have made efforts in this direction, but so far without much success. For a long time they have had their combined patent bureau in operation, under which they make a common defense against paying patent royalty for any patent, when there is a chance to escape. They now have a head center at Washington, through which, this year, they are making a desperate effort to carry laws in their favor, and pull up all patents by the roots. They have stuffed the grangers, making them to think that inventors, who are really their best friends, are their enemies; that the charge of ten dollars for using a patent drive well, which saves them two hundred dollars, or the cost of an open well, is a hardship; that payment for patents is nothing but robbery, and in this free country can no longer be tolerated.

With falsities like this the railroad agents have induced farmers to ask Congressmen to vote down the patent laws. They have drafted various forms of adverse patent bills, and caused them to be sent from different parts of the country, to different members of Congress, purporting that these bills represent the feelings of large numbers of their constituents, and asking that the same be introduced and passed. This system of deception has been so extensively worked up and manipulated by the railroad head center, that at last it has had its effect in the House of Representatives; and in that body there is to-day actually a large majority of members who are willing to encourage the false idea that new inventions and new industries are a bane to the people instead of a blessing; and these members are now ready to execute the wishes of their railway masters by passing laws that will give relief from paying further tributes to inventors.

The worst is that these hostile laws, while they undoubtedly increase the dividends of the railway people for the time being, will also deal a terrible blow to industries in all parts of the country. Every establishment in the land that manufactures under a patent, all workmen employed in such concerns, two hundred thousand patentees and their families, all must now have their property struck down or damaged to gratify the railway kings.

They wave their wands, and their newspapers cry out against patents; they manipulate Congress through false bills and deceptive representations, and that august body is unable to hold its own against them.

We will not repeat again the details of all the hostile bills now before Congress, but will only select two, either of which, as soon as passed, will accomplish all that the railroad schemers want. Here is the full text of the little bill introduced by Mr. J. A. Anderson of Kansas, and now before the House, by which the life of all new patents will be reduced from seventeen years to five years:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section forty-eight hundred and eighty-four of the Revised Statutes is hereby amended by striking out the word "seventeen" and inserting in lieu thereof the word "five;" and that all acts or parts of acts inconsistent herewith are hereby so modified as to be made consistent.

This bill will be a happy thing for the railroads, as soon as passed.

But here is one calculated to make the railway monopolist still happier. It was introduced by Hon. Mr. Voorhees, Senator from Indiana, and is now before the Senate, its passage expected every day. We give the full text:

S. 1,558. *Be it enacted, etc.*, That it shall be a valid defense to any action for an infringement of any patent, or any suit or proceeding to enjoin any person from the use of a patented article, that the defendant therein, or his assignor, purchased the patented article for use or consumption, and not for sale or exchange, in good faith and in the usual course of trade, without notice that the same was covered by a patent, or without notice that the seller had no right to sell such article; and in all such cases notice received after such purchase shall not have the effect to impair in any way the right of such purchaser as absolute owner.

If Mr. Anderson's patent bill passes, all new patents become free for use by railways and the public at the end of five years.

If Mr. Voorhees' bill passes, the free use of all existing patents is at once taken from the patentee and given to the railways.

It seems to us that the passage of these bills, or of any of the other bills which impair the rights of inventors to hold their patents, or prevent them from recovering damages against infringers, would be disastrous to the country and destructive to the interests of a large portion of the people.

There is at present writing a strong probability of their passage. But if effort is promptly made, they can be defeated. Let every patentee, every inventor, every manufacturer, every workman, every farmer, every individual, who believes in the maintenance of home industries and the encouragement of the useful arts, write letters personally, at once, to the Senators and Members of Congress, urging them not to sacrifice their interests and property in this wanton and unjustifiable manner.

Read the letter of Mr. D. L. Carver, in another column.

CABLE RAILWAYS FOR NEW YORK CITY.

The Rapid Transit Commission of New York City, under authority of a general law of the State, has lately mapped out and granted to one company in the city the routes for no less than sixty-six miles of new railway tracks within the municipal limits. These lines are to run up-town, down-town, cross-town, in fact in all directions. The commissioners appear to have legislated on the supposition that New York city is in great present need of more rapid transit lines, and will by its rapid growth soon require extensions. These wants, present and future, are amply provided for by the commissioners so far as routes and tracks are concerned; but we fear their judgment is ill-considered in requiring, as they have done, that the main lines of these new roads shall be worked on the cable system. What the people require is rapid transit; but the cable plan is in reality only a slow form of slow transit. All the cars must run at the same speed; if one train or one car is detained, the speed cannot be increased so as to make up for lost time; if the cable breaks, or a cogwheel gives out, all the cars, on both tracks, for the entire line must stop; all the streets through which the cables run are rendered dangerous to horse flesh by liability to tearing off shoes by wedging in the slot of the cable pipe.

The system has a variety of other objections. With a view to the presentation of these, our reporter lately interviewed Mr. F. C. Crowley, a street railway engineer, constructor, and operator of long experience, who has made a very careful examination of the Chicago cable roads. The report, which is quite interesting, will be found in our SUPPLEMENT of this week, page 6847.

After all that can be said by way of objection to the cable system, it must be admitted that in some localities, especially for hilly towns, it has proved very advantageous; in fact, it will work very well anywhere and in any city where rapid transit is not wanted. But for the streets of New York, it would seem as if a better and less objectionable system would be the employment of some form of independent motor, powerful, but fast or slow as needed, and susceptible of use in the streets with the same facility as horses.

MALARIAL FEVERS.

The case on trial described by Dr. Griswold in the *New England Medical Monthly* of August 15, referred to a pond in Berkshire County, Mass., near which many cases of ague and fever had occurred. The point was this: Did the existence of the pond cause the fevers?

The disease has been in time past by most writers reckoned a marsh fever, and it was commonly believed to be limited to regions and to seasons where vegetable matters were undergoing decomposition from moisture and heat—that is, to swampy lands and (except in the tropics) to the autumnal months. New England was formerly free from it. It is possible that a single case may have occurred occasionally in the extreme southwestern part of Connecticut, but practically ague was unknown there until 1860. In that year a most wonderful onward movement to the east and the north commenced, and it has continued unchecked till the present time, and in its progress it has overturned theories at a rate as remarkable as its own advance.

Commencing on Long Island Sound, at Southport, in 1860, it spread as already stated, with an irregular front, reaching New Haven in 1864, Hartford in 1872, and the northeast part of the State not till 1882. It has maintained a steadily epidemic condition ever since, having swept the State so fully that not a town is now exempt from its sway, except, possibly, a few in Windham and New London Counties. Running up the Housatonic Valley, it reached the northern line of the State in 1877, and in 1878 it crept over into Massachusetts at Lenox (the place referred to by Dr. Griswold) and Lee. It has already invaded the sacred precincts of Boston, and is in high march for Nova Scotia and Newfoundland, for all that we can tell.

This progress is astonishing, for no change has taken place in the surface or condition of the country to which it can be traced. Ponds and swamps have always existed of natural formation, and artificial ponds have been formed, dating back to the first settlements, but they have been harmless. Nor can we say that they have anything to do at the present time with the evil. For, disregarding its name of marsh fever, the epidemic has just as freely selected its victims on the hills as in the swampy valleys. Litchfield, "a city set on a hill," which had always boasted its healthfulness, acknowledged the tread of the invader in 1880, and he had come to stay, to their great disgust. And disregard-

ing also the fact that according to all previous theories a "good white frost" ought to destroy the malarial poison, the present epidemic has often maintained its activity in the very dead of winter. We are forced to conclude that the true cause, or causes, for the affection, and for its present eccentric northeastward march, yet remain for research.

The pollutions of streams by the refuse from factories, etc., may of course cause much injury to health, but there is no evidence that they ever produce ague.

THE HOSTILE PATENT BILLS.

One of the ablest articles that we have read in regard to various patent bills was recently published in the New York *Sun*. It is as follows:

"ATTACKING INVENTORS.

"Serious apprehension is felt among inventors and patent owners lest great and very injurious changes in the existing patent laws should be effected during the present session of Congress. Over twenty bills, most of them bad, have been introduced to alter these laws. One of the most striking reduces the life of a patent from seventeen years to five. Another empowers juries to fix the license fees to be paid by users of patent infringements, without regard to the patent owner's valuation of his property right. Another enables any user of an infringement to evade punishment by the simple plea that he did not know that the thing was patented or that the person selling it to him had no right to patent it. Another authorizes the user of an infringement to continue its use where it would be of the greatest benefit to him and most injurious to the owner of the patent, notwithstanding ample legal notice after his purchase that it was an infringement.

"Then we have bills to compel the owner of a patent repeatedly declared valid by the United States courts to give bonds for the payment of costs before commencing suit against an infringer; to make the plaintiff in such suits pay all costs if he does not recover damages to an amount seldom reached in such prosecutions, except where the defendant is a vender or a fraudulent manufacturer of the infringement; and to make the plaintiff liable not only for the costs of suit, but for the payment of the defendant's attorney when these and other ingenious devices to thwart justice chouse him out of an award of damages.

"There may have been some instances of injustice to innocent users of infringements through the peculiar methods of certain patent owners, either in securing their supposed rights or through the vexatious uncertainties affecting contested ownership of patents. The extent of such injustice, however, has unquestionably been greatly exaggerated. Even at the worst, it is in a very small ratio to the patent interest of the country as a whole. If the evils alleged exist in any degree, they may certainly be remedied by a less radical process than the destruction of all protection for property right in patents. To make laws of the proposed bills would annihilate the owners' benefits on a great number of patents, ruinously unsettle the values of all not made absolutely worthless, and affect injuriously all manufacturing interests dependent to any extent on patented processes or machinery.

"It is surprising that three members of the Senate Patent Committee, who represent States in which enormous sums of capital are invested in patents, and in which the prosperity of nearly the entire population is intimately connected with the maintenance of the rights of inventors and patent owners, should permit such measures to pass through their hands without careful scrutiny and strenuous opposition.

"These are questions in which the honor and material prosperity of the nation are opposed by the interests of petty rogues who wish to steal the fruits of others' brains."

[From the New York *Star:*]

"LEGISLATION ON PATENTS.

"It is a singular conception of right in property that animates a considerable number of the members of the present Congress, as demonstrated by the measures they have proposed affecting patent interests. A patent is virtually a contract between the Government, representing the whole people, and an individual who has something, of his own invention, creation, or discovery, that would be of practical value to the people were it known to them. In consideration of his making known, for common benefit, the results of his study, genius, or skill, he is guaranteed a reward in the form of an exclusive right, for a term of years, to whatever profits may accrue from the common use of that which before was his alone, he being given the right to control that use so as to reap pecuniary benfit from it. After the expiration of that term, the patent—except in a small percentage of cases in which there is reissue—becomes free to all, the presumption being that his reward is by that time sufficient.

"The first principle of value in a patent, as in any other form of property, is stability in possession—protection by law against theft. But the patent, though more liable to be stolen than almost any other property, is actually least of all protected, and were the bills now before Congress to become laws, would be practically deprived of almost all protection.

"It is a notorious fact that inventors and patent owners, as a rule, make nothing on the first five years of the lifetime of a patent. During that time they are mainly occupied in fighting patent thieves in the United States Courts—a very expensive business—and in introducing their inventions to popular knowledge. But one of the bills now pending in the House proposes to reduce the lifetime of a patent from seventeen years to five. And even for that time the value is to be destroyed by the ingenious devices to protect infringers which other bills comprise.

"The preposterous conceptions of making the owner of a patent pay all the costs of prosecuting an infringer, even though he may win his suit; of expecting him to prove guilty knowledge on the part of the user of an infringement when he purchased the thing; and finally, of permitting an infringer to continue his use and enjoyment of the infringement even after he is duly informed that he has no legal right to do so, and to use it even in manufacturing processes, the license fee to be fixed, not by the patent owner, but by a jury—all these are in the proposed bills. The owner of a patent that has been over and over again declared valid in courts of competent jurisdiction, it is proposed shall give bonds before he can begin suit to bring an infringer to justice, just the same as would one whose patent had never been put to test. All these things are calculated to amaze any just and intelligent person who will stop to think of the moral right of the patent owner to his property, and of the impolicy of depriving the community of the great benefits that accrue to the country from the inventor's genius, of which we shall certainly be deprived if our patent system is to be thus destroyed."

WATER LINE DEFENSE AND GUN SHIELDS FOR CRUISERS.

The plans adopted by the Naval Advisory Board in the construction of the new cruisers have called forth a large amount of criticism from various quarters. Among these is one by N. B. Clark, U. S. N., which was published in the *Journal of the Franklin Institute;* it has the merit of consistency.

As regards water line defense, objection is raised by the author on the score of the form given to the deflecting shields, which in the cruisers now building extend from a distance of four feet below the water line at the side to one foot above it at the center. The form given to this shield is that of three intersecting straight lines; the center being horizontal and the other two sloping toward the sides. The author argues that if this shield were a continuous curve, starting at the same points, and having the same rise as the other, it would have several advantages. The principal among these is the increased protection offered, due to the fact that the angle at which a projectile could strike would be more acute in the curved than the plane-sided shield. This is especially the case when the ship is inclined to one side, which would be the case when rolling in heavy weather. Among the other advantages are the reduced weight, the increased room afforded for the boilers, together with increased stiffness of the entire ship.

Taking up the gun shields of the new cruisers, it will be remembered that the single gun turrets are almond-shaped, the muzzle of the gun projecting at the sharp end. With this form, a projectile striking the turret forward in the direction of the gun would glance off without doing any damage.

But since this form of shield (with the proposed thickness) is only effective when the gun is pointed toward the direction whence the projectile comes, the author argues that that part of the shield which is useless for protection ought to be removed. He would therefore have the back of the turret removed entirely, leaving the rear free, or only protected sufficiently light to exclude flying splinters and bursting shells. This would reduce the weight considerably with practically equal safety.

In discussing the engines, the author advocates the adoption of emergency power, since by so doing considerable reduction in the weight of machinery would follow. He proposes to do this by two sets of engines, which can be connected or thrown out of gear with the propelling appliances at will; under ordinary circumstances, when high speed is not essential, one of these light, fast running engines would be in use, whereas in emergency the other would be connected, which being fed by emergency boilers similar to the locomotive type would give the ship the desired velocity.

Breaking Faith.

AN OPEN LETTER TO THE HON. D. W. VOORHEES, SENATOR IN CONGRESS FROM INDIANA.

HON. SENATOR D. W. VOORHEES:

Dear Sir: In the matter of your bill, No. 1,558, for the purpose of amending the patent laws, I feel myself personally interested, and would like to come to a definite understanding as to my rights in this patent business.

I have had five patents granted to me, and on my part I have paid Government fees and complied with all the conditions of the law, and in consideration of this the Government has virtually agreed that I shall have the exclusive right to *manufacture, sell,* and *use* the invention patented for seventeen years.

Now, I understand that you propose without my consent to repudiate the contract; and while I supposed that the Government would stand by me and protect my rights in this species of property, you seem to be taking sides with those who by *fraud* or *theft* will appropriate my property to their own use.

A law to this effect has already passed the House of Representatives, and is now before the Senate, and is being vigorously pushed by Senators. I hereby wish to enter my most solemn protest against the infamous fraud.

The law which you now contemplate passing provides in substance that a man may sell my property, although he has no right to it whatever, yet the sale shall be valid, and this thief can convey a good title. The following is the text of your bill, which wears unmistakable marks of fraud on every syllable of it:

"That it shall be a valid defense to any action for an infringement of any patent, or any suit or proceedings to enjoin any person from the use of a patented article, that the defendant therein, or his assignor, purchased the patented article for use or consumption, and not for sale or exchange, in good faith, and in the usual course of trade, without notice that the same was covered by a patent, or without notice that the seller had no right to sell such article, and in all such cases notice received after such purchase shall not have the effect to impair in any way the right of such purchaser as absolute owner."

Now, suppose I should steal your jack knife or your horse and sell it to a third man; in order to save your title you must hasten and notify the purchaser, before he buys, that it is stolen property; for after he has purchased it he is the "absolute owner," and you will be barred forever after; and this is precisely what your bill proposes to do with inventors and owners of patents.

You say, if the man purchase the patented article for *use*, that will clear him; but that is just what I own—the *use* of the article; or if he purchase "in good faith," that shall make his title valid, but how am I to prove that he did not purchase in good faith? Or if he purchase it in the "usual course of trade," he becomes the "absolute owner;" any notice that I may give him after he has purchased will avail me nothing. In conclusion I would say that I have often heard of wickedness in high places, but I think this is the most flagrant attempt at legalizing theft of anything that has ever transpired in the Congress of the United States.

But hoping that there is wisdom enough in the Senate, or the President, to defeat the measure, I remain,

Respectfully,
D. L. CARVER.

Hart, Mich., March 10, 1884.

Th. Du Moncel.

It would appear that the column of obituary notices of scientific men was becoming too much of a permanency in our paper when week after week it heralds the demise of such men as Siemens, Guyot, Smith, Balfour, etc. Now we are under the painful necessity of announcing the death of the Count Theodore Achille Louis du Moncel. This distinguished electrician was born in Paris on March 6, 1821. He spent his early days in the study of archæology and the arts, and it was not until 1852 that he began to devote himself to electricity. So little was known of this obscure phenomenon of nature at that time that the field for study was immense, and it required a peculiar perseverance and an unswerving purpose to make this branch a special study. He was the inventor of numberless electrical contrivances, and he contributed in no small degree to the advancement of knowledge, practical and theoretical, in this particular direction.

His work on the application of electricity went through three editions, and his Practical Treatise on Electricity was published at the time of the Exposition of 1878, and gave quite an impulse to the movement in electricity started at that time.

Later, he published works on the telephone, electric lighting, and electricity as a motive power. His works were written while he was serving as editor of *La Lumiere Electrique.*

In 1860 M. Du Moncel was electrical engineer of the telegraph wires of the city of Paris, and he held this office till 1873. He was elected an officer of the Legion of Honor in 1866, and belonged to a number of scientific and literary societies. In 1874 he was elected a member of the Academy of Sciences.

We offer our contemporary, *La Lumiere Electrique,* our sympathy at this her loss.

The Remarkable Storms of February 19.

The Signal Service Bureau has issued a series of charts showing the course of the terrible storms which swept over so large a portion of the country on February 19.

The central area of barometric minima stretched from Dakota in a great bend over the southern end of Lake Michigan, and thence to the north of and far down the valley of the St. Lawrence. From thence the wind was generally southwest of the Mississippi, and north at the east, with remarkable contrasts of temperature in localities. The storm lasted from about seven o'clock in the morning until after midnight, being most destructive in Virginia, North and South Carolina, Georgia, and Alabama. The loss of property thereby is placed at between three and four million dollars, with about 1,000 killed and a great number severely wounded. Some 10,000 buildings are said to have been destroyed, with horses, cattle, hogs, and other domestic animals in great numbers.

HELL GATE ELECTRIC LIGHTHOUSE.

(*Continued from first page.*)

made by the sharp trend of the land. It will be similar in construction to the tower on Coney Island, and at an elevation of 250 feet above the base will have an electric light of great power. The tower will be completed during the summer, and will cost about $20,000.

The tower consists of four corner posts, placed so as to form the frustum of the pyramid, and united by struts and tie rods. The posts are placed 54 feet between centers each way at the base, and 5 feet at the extreme top. Each side is divided into ten panels, which decrease in height toward the top, as shown in the elevation, Fig. 1. Each column is composed of two angles united by two systems of latticing, as shown in Fig. 8, which is a section through the column of the lowest panel. In the first or lowest panel each angle iron is 6″x6″x¾″ and the lattice ½″ thick; in the second each is 5″x5″x½″, lattice ⅜″. These dimensions are gradually reduced in each series until we reach the ninth and tenth, which are, from outside to outside, 5 1/16″x5 1/16″x1 1/16″, lattice ⅜″. The first strut consists of four angles 5″x3½″ x½″; the second of four angles, 4″x3″x½″; third of two angles, 5″x5″x½″. The dimensions decrease toward the top, the ninth, upon which rests the floor of the gallery, being 2″x2″x 1/16″. The method of latticing the two lowest struts is clearly show in Figs. 4 and 5, Fig. 4 being a plan view at the end of the first strut, and Fig. 5 an elevation of the same.

Adjoining ends of the pieces composing the columns are united to each other and to the struts, as shown in Figs. 4 and 5. At the first joint the fish plate is 5″x5″x 5/16″, the gusset plate ½″ thick; these are reduced toward the top, the tenth series being, fish plate 2½″x2½″ x⅜″, and gusset ⅜″ thick. Across each corner are braces, as shown in Fig. 4. The tension rods vary in diameter from 1⅜″ for the bottom panel to ½″ for the top. The lowest rods are 64′ 6⅜″ long, the top 9′ 3⅝″ long.

Fig. 6 is an elevation at the foot of a column, Fig. 7 being a plan of the same. Each column is anchored by bolts to a block of concrete 9′ square at the base and 10′ high, sunk in the ground, the distance between centers being 54′. Their position is shown in Fig. 2, which is a plan view of the tower. The gusset plates are ½″ thick.

The gallery of the tower is 11′ wide, the projecting part being supported by braces against the columns. The railing is 3′ 4″ in height, and is half way between the floor and a circular frame having a radius of 6′ 7 1/16″, from which are suspended the lamps. The tops of the columns are united by cross bars as well as by struts parallel with the sides, and upon these is carried a sheave over which passes a hoisting rope, one end of which is secured to the top of the elevator car and the other end passes down one side of the tower to about the middle, where it is attached to a weight (shown in Fig. 1) which overbalances a little the weight of the car. Through two diagonally opposite corners of the car pass two guide ropes, the upper ends being secured to one of the cross bars at the top of the tower, and the lower ends being firmly held by a block of concrete sunk in the ground in the center of the base. These ropes keep the car from being swayed by the wind. Still another rope extends from the top of the tower through the car to the concrete block. By means of this rope the passenger is enabled to work his way to the top of the tower. In the top of the car is placed a safety attachment designed to clutch the side ropes in case the center rope should break. The center rope is steel, ⅜″ n diameter, the two side ropes are ¾″, and the starting rope ½″. The car is 6′ 7⅜″ high and 4′ 7″ wide.

The contract for building the light house was let to the Cooper Manufacturing Company, of Mt. Vernon, O. The Brush Electric Light Company of Cleveland, O., will furnish the dynamos and lamps. As these have not yet been completed, we are unable to furnish details.

A night view of Hell Gate and vicinity, after the tower shall have been finished, forms our frontispiece.

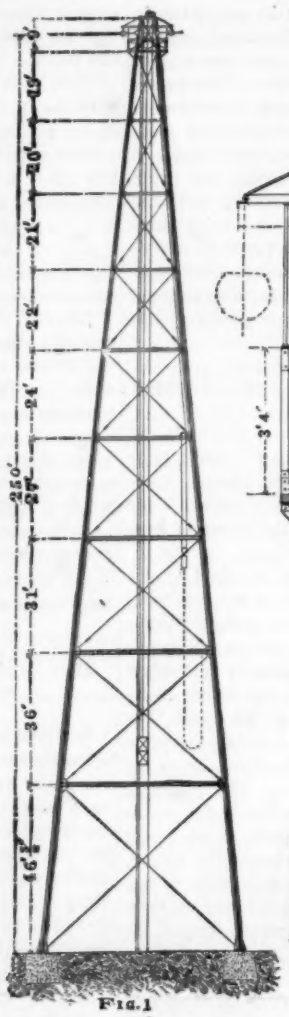


Fig. 1

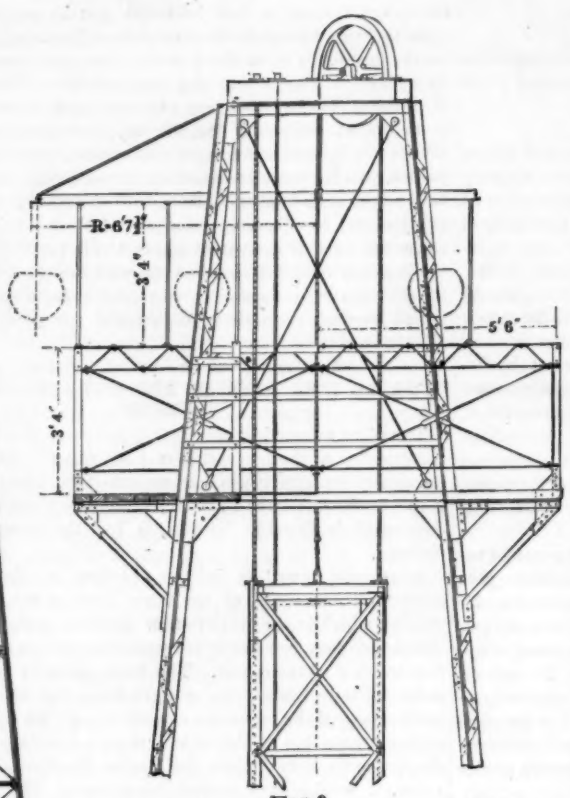


Fig. 3

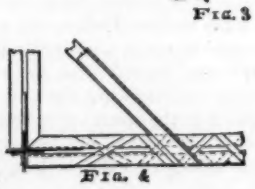


Fig. 4

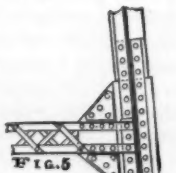


Fig. 5

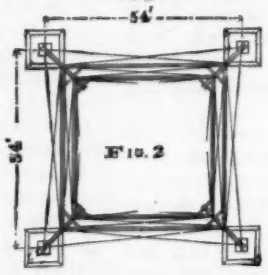


Fig. 2

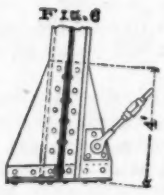


Fig. 6

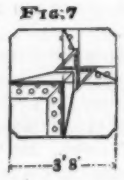


Fig. 7

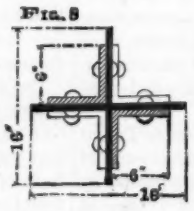


Fig. 8

THE NEW ELECTRIC LIGHT AT HELL GATE, NEW YORK.

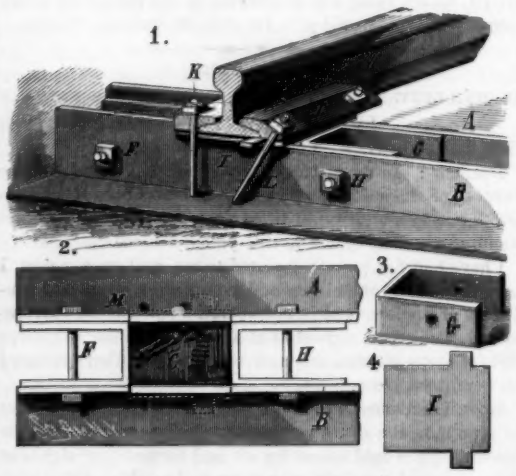
A Representative New England Exhibition.

The Massachusetts Charitable Mechanic Association will hold its fifteenth exhibition in Boston during the ten weeks commencing in September next. The association is now more than three-quarters of a century old, has probably the finest exhibition building in America, and its members and officers represent a large proportion of the brains and money engaged in Massachusetts manufacturing enterprise. An ample past experience enables the management to so arrange the details that there will be the least possible friction in apportioning space satisfactorily among exhibitors, and these displays have always been exceedingly attractive, at a time of year when Boston usually has large numbers of visitors from all parts of the South and West.

METALLIC RAILROAD TIE.

The base of the tie is made wide, to prevent its being pressed into the road bed. The adjoining sides of the plate are flanged, and between the flanges are placed blocks, C, of paper or other material, which are made of such a thickness as to rise a little above the upper edges of the flanges, thus serving as cushions for the rails and preventing them from touching the tie. These blocks are kept from moving either outwardly or inwardly by U-shaped bars (shown detached in Fig. 3) placed between the flanges with their bends resting against the ends of the blocks, and held detachably in place by bolts, H F, as indicated in Figs. 1 and 2, the latter being a plan view. The base of the rail rests upon wear plates, Fig. 4, placed upon the blocks and kept in place by chairs, J, secured by bolts. The bolts at the outside of the rail are vertical, those upon the inside are inwardly inclined. The outer edges of the chairs rest against shoulders formed upon the vertical flanges, B, thereby preventing the rails from spreading. The wear plates are kept from moving upon the blocks by the shoulders on the flanges and the inclined bolts. With this construction the rails can be taken up and replaced without disturbing the ties, and the blocks or cushions can be taken out and renewed without disturbing either the ties or the rails.

This invention has been patented by Mr. Charles H. Van Orden, of Catskill, N. Y.



VAN ORDEN'S METALLIC RAILROAD TIE.

Structural Steel.

At a recent meeting of the American Society of Civil Engineers, New York, a paper on Structural Steel, by E. B. Dorsey, C.E., was read. The paper gave the results of an examination by the writer into the subject during two recent trips to Europe.

The steel used for structural purposes is called generally in England mild steel, and in Germany homogeneous iron. Experts in Great Britain generally rely more upon physical tests and the reputation of the manufacturer than upon chemical composition. The physical requirements are stated, and the manufacturer uses his discretion as to the composition which will answer these requirements.

The rules for testing steel adopted by the British Admiralty, by Lloyd's Register, and by the British Board of Trade were given. The tendency among English engineers is to use steel still softer than has heretofore been thought best. Some large builders use nothing in their boilers over 26 long tons tensile strength per square inch and 25 per cent elongation in 8 inches. Others advise the use of steel of from 23 to 25 long tons tensile strength, with the same elongation.

American engineers require from 15 to 20 per cent higher tensile strength than the English. The Siemens-Martin, or open hearth, steel is preferred by nearly all experts for structural purposes, the Bessemer steel being principally used for rails. Ship builders are decided in their preference for the open hearth steel. A much larger number of plates would be condemned of the best wrought iron than of steel. Data were given as to loss of strength in steel plates by punching. Steel can be manufactured into much heavier, longer, and wider pieces than wrought iron. Steel rivets are used on the Clyde exclusively in riveting steel. The new Forth Bridge is to be built of mild steel. The use of mild steel is extending very rapidly in Europe, and has fast superseded iron for structural purposes.

During the discussion Mr. Theodore Cooper referred to the conservative stand taken by him in a paper presented to the Society some four years since, and expressed the opinion that at the present time he would feel still more conservative in regard to the use of iron instead of steel for structural purposes, particularly for bridges or similar constructions. For boilers for ships, etc., steel has answered very well, but for structures he would be inclined as yet to advise the use of wrought iron. In compression, in his opinion, steel has not been proved to be as strong as wrought iron, and the necessity for most careful inspection is greater for steel than for wrought iron.

Mr. M. N. Forney referred to the increasing use of steel for rails, for wheel tires, and for various parts of locomotive machinery. He referred to the record of accidents, which showed that some 66 per cent of accidents in this country are due to derailment, and only 8 per cent due to the same cause in England. In this country the number of broken wheels is very great, and the tendency toward the use of steel for tires is decided.

Vice-President Paine gave details of the methods of tests of steel in use during the construction of the Brooklyn Bridge, and expressed an opinion favorable to the use of steel.

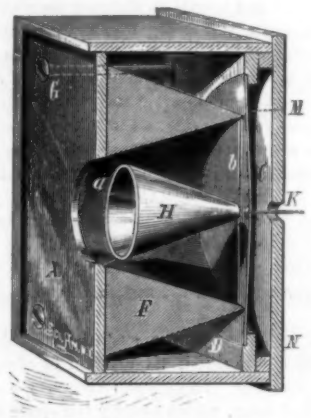
Ignoble Fate of a Steamship.

The Great Eastern has been purchased by the British Government for use as a coal hulk at Gibraltar. "How have the mighty fallen!" may well be said of this unlucky vessel. Born out of due time, she has never fulfilled the hopes of her projectors. Her only useful period was when she was employed in laying submarine cables. As a freight and passenger steamer she was a dismal failure. She was too big for any port in Great Britain but Milford Haven. Her career has been punctuated by disasters. She has been tried in a dozen capacities, and has failed in all, and now she is degraded to the humiliating function of a coal hulk. Nor is there yet any probability that the demands of commerce or transportation will ever justify the building of vessels of her size. For not only is the difficulty of finding work for such monsters almost insuperable, but, as the New York *Tribune* says, they are objected to on the practical ground that it is always unsafe to put too many eggs in one basket.

CLEAR boiling water will remove tea stains; pour the water through the stain, and thus prevent its spreading over the fabric.

IMPROVED ACOUSTIC TELEPHONE.

The front board, A, of the box is provided with a central aperture. The diaphragm, M, is stretched over the central opening of a board, D, which has strengthening ribs on its under side and along the edges. An annular block of wood, F, whose thickness decreases from the top toward the bottom on the inner as well as the outer side, is placed between the front board and the diaphragm. The upper opening of the block coincides with the central opening of the front board, and the bottom opening is smaller than the opening in the board, D. The bottom edge of the block is pressed upon the diaphragm by bolts, G. In the central opening of the block is a funnel-shaped vessel, H, held in place by



HUSTON'S ACOUSTIC TELEPHONE.

wires, *a b*, at the top and bottom, which hold the lower end of the funnel a short distance from the diaphragm. A button is fastened to the middle of the diaphragm, to which is fastened the wire, K. The funnel concentrates the sound waves and guides them to the diaphragm, thus causing strong and distinct vibrations that reproduce the words very plainly. The diaphragm is formed of alternate layers of skin and a textile fabric.

This invention has been patented by Mr. H. E. Huston, of the firm of Lodge & Huston, of Monticello, Illinois.

The Center-cycle.

We have had brought to our notice, says *Engineering*, a very ingenious apparatus which combines the speed and simplicity of the ordinary bicycle with the stability and safety of the tricycle. This apparatus, to which the inventor, Mr. Edward Burstow, of Horsham, has given the name of center-cycle, is a mechanical roadster, which has the general appearance of an ordinary large wheel bicycle fitted with four smaller supplementary wheels, one pair in front of and one pair behind the center or driving wheel.

Over the center of the large driving wheel is a saddle attached to tubular framing, similar to that in the best bicycles, and the wheel is driven in the ordinary way by means of a pair of cranks fitted with treadles. The steering of the machine is effected by means of a steering handle, which operates, through a curved bar and a Hooke's joint, upon the axle of the forward pair of wheels, which, in its turn, acting through a lever, sets the rear axle to a similar angle, both being in directions normal to the curve along which it is desired the apparatus is to travel. In this respect the action is very similar to that of a roller skate, and is quite as easily and as smoothly controlled.

So far the description would be applicable to an apparatus of the tricycle type, but furnished with five wheels instead of three; but the characteristic feature of Mr. Burstow's invention, and that which makes it superior in several respects to both the bicycle and the tricycle, lies in the fact that not only can the four smaller wheels be turned at will in any desired direction, but they can, each or all, be lifted—while the machine is in action—quite clear of the ground; the apparatus at that moment is instantly converted into a single wheel apparatus, carrying, it is true, for the time the extra weight of three idle wheels, but having in compensation but half the friction of a bicycle, and possessing in the four suspended wheels, which can be dropped at any instant, a reserve or element of stability which makes the apparatus exceptionally safe at the highest speeds.

In practice the apparatus is adjusted so that the principal weight is borne by the large center wheel, and the four side wheels are but barely grazing the ground; when in this condition the machine can at any moment be made to run on the four little wheels, or on the center wheel, or upon different combinations of the center and side wheels.

From the above description it will be observed that Mr. Burstow's apparatus is singularly unaffected by roughnesses of, or small obstructions on the road; for the effect of an obstruction on the center wheel is to momentarily lift that wheel, and the machine runs past the obstruction on its side wheels, which then carry the weight; and similarly, if the side wheels run against an obstruction they become lifted thereby from the ground, and the center wheel receiving the weight carries the apparatus past the impediment. The rider has an obvious advantage in sitting directly over the center of the driving wheel; he is thereby not only in the best possible position for propulsion, but his center of gravity being over the center of base he is in the position of maximum stability.

The Burstow center-cycle has been employed by the postmasters of Horsham and Saxmundham with great success, having been used by the letter carriers and telegraph messengers for twelve months in those districts without a single accident being recorded, and it has been employed by local bakers, with equal success, for delivering bread, and thereby saving the expense of a horse and cart.

Cigar Making at Seville.

A letter from Seville describes the government cigar factory of Spain. The factory is 700 feet long, and almost as wide, and very dirty. At the time it was visited by the writer, there were 250 young girls in the vestibule, making cigarettes; in the next room were 100 other girls engaged in the same occupation, and on the next floor 3,000 women as close as sardines in a box, in a single room, making cigars, some of them having their babies with them not a month old, while dogs were lying on the tobacco stems. The women were divided into sevens at each table, three on each side of the mistress at the top. Around each table were shelves against stone pillars, on which lay children's shoes, socks, and clothes. The air was stifling, and the buzz of conversation was now and again broken by the wailing of the babies. The flooring was so dilapidated that it was possible for an incautious visitor to fall through. Two other side apartments 100 feet long were packed with laborers. The factory consumes 10,000 pounds of tobacco per day and employs 5,000 persons, who receive 50 cents per day for 12 hours' work. The matron at each table gets her pay from the women she commands.

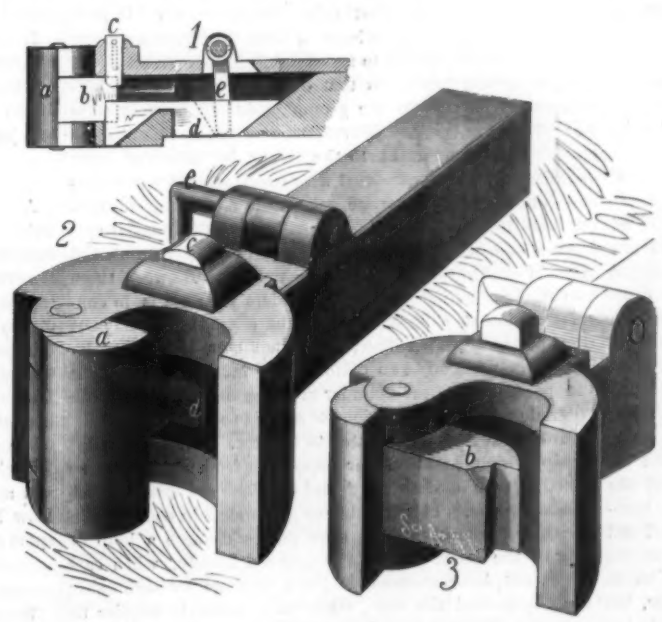
IMPROVED CAR COUPLING.

The accompanying engraving shows an invention recently patented by Mr. W. H. Thurmond, of Forsyth, Georgia. The draw bar has a longitudinal vertical recess provided with backwardly inclined surfaces, the forward one of which forms a shoulder, as indicated in the sectional drawing, Fig. 1.

On the upper part of the bar are formed two ears, which are perforated transversely to receive a rock shaft that is worked by an arm at the side of the bar. Secured to the rock shaft between the ears is an arm, *e*, Fig. 1, extending down through a slot in the longitudinally movable thrust bar, *d*, fitted into the recess in the base portion of the draw bar.

Pivoted to one ear of the bar is a coupling hook, whose form is clearly shown at *a b* in the cuts. Through an aperture in the upper part of the bar is a latch, *c*, having a movement in a vertical line.

When the thrust bar is moved back by means of the rock shaft, *e*, the latch, *c*, is raised, and drops in front of it and prevents its forward motion. The coupling hook can then be moved to the position shown in Fig. 3, the bevel at *b* enabling it to lift the latch. While the latch is raised the thrust bar drops forward to the position shown in Fig. 1. In the act of coupling the hook is turned upon its pivots, the circular rear portion raising the latch and pushing the thrust bar back and up. When it has assumed the position



THURMOND'S IMPROVED CAR COUPLING.

shown in Fig. 2 the rear part has passed the thrust bar, allowing it to drop forward, where it prevents the return of the hook.

All the working parts of the coupler are protected, since the bumping is upon the outside of the draw head. The cars cannot be uncoupled until the thrust bar has been moved back sufficiently to allow the hook to turn.

A SPOONFUL of kerosene oil put into cold starch will prevent the iron from sticking.

IMPROVEMENT IN THE LECLANCHE BATTERY.

The Leclanche Battery Co., of No. 149 West 18th Street, New York, have introduced a new form of jar and cover for the well known prism battery, an illustration of which we give herewith. The cover rests upon a shoulder inside of the jar, which is oval in shape, the rim of the jar above the cover being concave in shape. The cover when in place closes the jar sufficiently tight for ordinary purposes; but, if desired, it may be hermetically sealed by pouring on the

PRISM BATTERY, COMPLETE.

cover melted wax, which will spread over the cover, run into the concavity of the rim, and be held firmly in place, thereby effectually sealing the jar. Any kind of wax may be used for the purpose, but paraffin is preferable on account of the ease with which it can be removed. The cell can be unsealed with an ordinary pocket knife whenever necessary to renew or clean it. The latter process, however, will scarcely be necessary, as the paraffin prevents the salts from climbing up and fouling the cover. A cell thus sealed can be transported on boats, cars, and other vehicles without danger of slopping over the liquid. The adoption of the new jar and cover is a manifest improvement, and will undoubtedly add to the reputation of this famous battery. The jar and cover have both been patented.

Successful Artifice in Discovering a Secret.

Mr. F. J. R. Carulla, F.C.S., general manager of the Landore Siemens Steel Works, recently delivered a lecture on "The Steel Age," in which he referred to the experiments of Huntsman, the Doncaster clock maker, who perfected the process of melting blister steel in crucibles, and producing a homogeneous ingot, about 1740. Huntsman endeavored to keep his process secret, with the following result: "One cold winter's night, while the snow was falling in heavy flakes, and the manufactory threw its red glare of light over the neighborhood, a person of the most abject appearance presented himself at the entrance, praying for permission to share the warmth and shelter which it afforded. The humane workmen found the appeal irresistible, and the apparent beggar was permitted to take up his quarters in a warm corner of the building. A careful scrutiny would have discovered little real sleep in the drowsiness which seemed to overtake the stranger, for he eagerly watched every movement of the workmen while they went through the operations of the newly discovered process. He observed first of all that bars of blistered steel were broken into small pieces two or three inches in length, and placed in crucibles of fire clay. When nearly full, a little green glass broken into fragments was spread over the top, and the whole covered over with a closely fitting cover. After a lapse of from three to four hours, during which the crucibles were examined from time to time to see that the metal was thoroughly melted and incorporated, the workmen proceeded to lift up the crucible from its place on the furnace by means of tongs, and its molten contents, blazing and sparkling, were poured into a mould of cast iron previously prepared; here it was suffered to cool, while the crucibles were again filled and the process repeated. When cool the mould was unscrewed and a bar of cast steel presented itself, which only required the aid of the hammerman to form a finished bar of cast steel. How the unauthorized spectator of these operations effected his escape without detection tradition does not say, but it tells us that before many months had passed the Huntsman manufactory was not the only one where cast steel was produced."

A Dairy Exhibition at Munich.

The American Government has received an invitation to participate in an exhibition of dairy products at Munich, in October, 1884, under the management of the general committee of the Agricultural Union of Bavaria, in connection with the Bremen Dairymen's Union.

Sound Motors.

Mr. Edison's "motophone," in which the vibration of a telephone plate or "tympan" under the action of the voice is made to work a ratchet wheel round, anticipated the apparatus of Dr. Dvorák, of the University of Agram, in Croatia. Through the kindness of Mr. W. H. Preece, F.R.S., we have, says *Engineering*, seen a set of Dr. Dvorák's apparatus in action. The source of sound is a tuning fork kept in vibration by electro-magnetism and mounted on a resonance box. The open mouth of this box or chamber is the source of sound, and the sound mills are placed in front of it. One of these consists of a cluster of light glass balls suspended from a cross-shaped frame which is pivoted on a needle point. Each ball has a little nipple blown on its side, the nipple being pierced with a hole. The holes are on the same face of each ball round the cluster, that is to say, they all point in one way and receive the sound impulses one after another as the group of balls revolve, just like the sails of a windmill. The wall of the balls opposite the nipple, is, of course, entire, and the motion is due to the reaction on it. Another mill consists of four little stiff flags or plates of paper-like material pierced with holes, and suspended from four crossarms carried by a pivot as before. The holes are so pierced as to make small open nipples as before on a needle point. The holes are 0·6 centimeter apart. When placed before the resonating cavity, with the smaller ends of the nipple-like holes toward it, the card is repelled and attracted if the back of the card presenting the wider openings of the nipple is placed before the resonator. A similar mill is made with plane flags without holes, and the motion is intensified by placing between it and the cavity of the resonator a brass ball, or Helmholtz resonator, with open nipples at opposite diameters. These nipples are placed in line with the resonating cavity and the mill, the larger nipple being next the cavity. When a lighted paper or the hand is held behind the Helmholtz resonator, a distinct puff of wind is felt to issue from the nipple farthest from the resonator; and it is this puff of wind which, impinging on the vanes of the mill, causes it to rotate. A screen pierced with 100 conical holes may also be placed between the ball resonator and the mill in order to distribute the breeze. Another of Dr. Dvorák's rotators, also very interesting, is a flat cylindrical paper box, of glazed paper, having four projections on its sides, each carrying a short open tube of paper. It is a resonator with four openings, and, when suspended by a silk thread from a standard in front of the sounding box, begins to twirl round.

Stealing a Ride in England.

A man wishing to travel free from Wolverhampton, England, to Liverpool, procured two stout pieces of rope, which he fastened to the axles of a railway carriage, leaving a noose at the end of each. Into one noose he put his legs while he inserted his shoulders into the other. In this position he hung when the train started. The train was an express, and did not stop until Crewe was reached, which is about 70 miles from Liverpool. He was rather uncomfortable when the train began to move, but when it got into full swing he had real torture, and when he reached Crewe he was nearly dead with fright. Here he was taken into custody. To the magistrate who adjudicated on the case he explained that his sensations when swaying to and fro were something awful, and the effect of the sleepers as they rushed past him nearly robbed him of reason, and he "was afraid that every moment the rope would slip from his shoulders and hang him." The magistrate decided that he had had enough punishment, and, remarking that he was not likely to repeat the experiment, sent him about his business.

This must be a good deal worse than riding on a truck, which American tramps sometimes do.

Why Apprentices are Scarce.

A contemporary writer says it is principally because of the conceit of weak and foolish parents, who could not think of allowing their boys to soil their hands with manual labor, or tarnish their pedigree by associating with common workmen. Many and many a young man have I known whose aptitudes called to him with all the imperious demands of instinct to learn a trade, but he was prevented from doing so by his parents, who preferred to see him filling the more important and dignified position of clerk, often working fifteen hours a day for $15 per month, and sometimes yielding to the small temptation to leave unpaid his tailor's and washerwoman's bills. Or if he escaped the clerkship, he was almost sure to be found among the luckless ninety and nine professional men who stand off and eye with green envy the one in the round hundred who has made a success. It is not lack of attention to the new workman that is lowering the standard in mechanical trades, but the folly of parents in closing the doors of the trades in the face of their sons, and in the absence of good material we get bad. It is very often the case that we get hold of a boy who has but few or no qualifications, natural or acquired, for a trade, but he can probably make more money at that than at common labor, and as we can get no better, we have to do the best we can. There is no doubt but we are getting poorer subjects every year for apprentices for this very reason. But we can reach a point so low that it is impossible to go any lower, and I believe we have about reached that point in some lines of business. Some parents, and boys too, are at last getting their eyes opened. They are learning that they cannot plant dudes and raise men. Many bubbles have been pricked, and much gilding has worn through. Labor is becoming more dignified, because more than ever before is it wedded to thought. The manual training schools which are springing up in nearly all of our large cities are giving instruction to many boys whose parents, perhaps, would not at the start consent to them entering the shops. These schools are doing a good work in teaching the principles of trades, in fostering a genuine love for mechanics, and in pointing out the way to the special field where the young man can labor with the assurance of receiving his highest reward. With such brightening prospects as the work of the manual training school warrants, we see no reason for fearing that the race of good workmen in any trade will soon die out. On the contrary, we believe we will see mechanics increasing in numbers and skill from year to year.

IMPROVED HAND TRUCK.

In the invention herewith illustrated, recently patented by Mr. C. F. Stremel, Cresco, Iowa, a rod is pivoted to a standard secured to the upper cross bar of the truck. The free end of the rod is forked, and the ends of the prongs are bent down so as to form hooks. The pivoted end is flattened and provided with a series of apertures through either of which the pintle can be passed. This end projects beyond the pivotal point toward the handles of the truck, and serves as a handle by which the hooks can be disengaged from the package. When a bundle of barbed or other wire

STREMEL'S IMPROVED HAND TRUCK.

or any bundle is to be loaded on the truck, the forked end of the rod is raised, the truck is put in position for loading, and the forked end is then lowered on the bundle, holding it securely in place. By raising the forked end of the rod the bundle is released. The device can be adjusted to trucks of any common size, and can be attached or detached very quickly.

The Cable as It Is.

The cable system for passenger traffic as applicable to the streets in New York city is thus criticised in the Brooklyn *Union* by one of its correspondents, who evidently knows whereof he writes:

The so-called Rapid Transit Commission for the city of New York, while proposing an extended plan for new railways in its streets, seem to have assumed that the cable, or rope traction, is the method best adapted for street transit. As little appears to be known by the public of the operation of this system, it is important that it should be explained somewhat in detail. Its difficulties and objections are so apparent to any one investigating the Chicago cable railway, that with a full knowledge of them the citizens of New York would not consent to its adoption in their streets. Its most important feature is that of a rope running on permanent bearings under the ground, midway between each pair of rails or tracks. Movement is given to this rope by engines located adjacent to the tracks, by means of large cylinders or drums connected with them, around which one end of the loop of wire rope passes, the rope being continuous, and the other end a loop, passing around a similar cylinder at the outer end of the roadway. Be it any number of miles in length, the rope must be endless. Between these two extremes and around the cylinders the rope is in constant motion at a speed fixed at the engines. It may be three or six miles per hour, but cannot be moderated or increased between any two cylinders; it must be constant at the speed given at the cylinder near the engines. It cannot be graduated to the variations of speed in street traffic.

Movement is communicated to the cars by what is called a grip, which is an iron bar depending from a grip car, so called, placed in advance of and to which are attached the passenger cars. This iron bar or grip rod is in contact with the cable constantly. The rope passes through a loop or ring in the lower end of the grip rod loosely, when cars are at rest, but movement is given to them by tightening the grip around the rope, when they instantly acquire its velocity. When a stop is desired the grip is released, the brakes are put on, and momentum checked.

It will readily be seen that a rigid system operated from a remote center involves insuperable difficulties for the ever varying conditions of street traffic. When the rope breaks or is thrown out of its bearings, the movement of cars is suspended—which has often occurred in Chicago—and cannot be released until the rope can be repaired or spliced, often requiring several hours, stopping not only a single car, as by other systems, but all between any two cylinders—it may be 10 or 100 cars, and it may be through any number of miles. All the cars moving in either direction in that circuit are compelled to stop until the rope is repaired, or be moved by horses, to which the Chicago road has often been obliged to resort. This difficulty prevents the continuity of service which is indispensable for any of the streets of this city.

The crossing of other tracks is not accomplished successfully at Chicago, as the grip must for the time be released to pass the intervening obstruction, and its connection again becomes uncertain, and involves risk, as momentum must be sustained, and cannot be checked suddenly should some obstacle come in its way.

The grip rod connects with the rope through an open slotway, which must be continuous through the center length of the road, between each pair of tracks. This slotway is a permanent opening, five-eighths inch wide in the Chicago road, which has proved just wide enough to let in the calk of a horse's shoe and results in violently tearing off the shoe and injures the hoof and ankle, this having often occurred. The construction of this system of road places a series of contingencies in the center of traffic which are constant and liable to interrupt business upon the streets, besides destroying all continuity of service on the road itself; all being governed by a fixed movement remote from the car, but holding it firmly in its grasp, and forcing all the traffic of the street to its rigid laws. Collisions are of frequent occurrence, and unavoidable with a system which cannot be graduated to street travel, and which can only move at all by a sudden change from a full stop to the speed of the cable; be it three miles or six miles an hour, a jerk is inevitable.

While the operation of the system is subject to many difficulties not enumerated, its method of construction is a serious consideration. In Chicago trenches have been dug four or five feet deep, which occupy the space between each pair of tracks; they are lined with concrete, made of broken stone and cement, in which trenches the iron frames and wheels are fixed on which the rope moves. These trenches or sewers are permanent, have manholes at intervals, and are accessible for repairs, and are always open through the slotway to the street surface, and many men are constantly engaged in removing the substances which fall through the slotway, which are taken out through the manholes referred to. This space may perhaps be spared for such uses in a street as wide as State Street, Chicago, but is entirely impracticable on the narrow streets of New York or Brooklyn, now so largely occupied with underground complications.

It is pertinent to inquire whether rapid transit is possible by such a system on our streets. The legal and the safe limit of speed on the surface is six miles per hour. It is clear that the rope traction system cannot maintain this average as even as the horse cars can. The frequent full stops and the impossibility of accelerating speed after such delays will render the average much below that. At a rate of speed above six miles its momentum rapidly increases and becomes more difficult of control—in fact, has proved an element of great danger. In Chicago fourteen persons have been killed by the system in one year, as shown by the admission of the president of the Chicago cable road.

It is evident that the rope traction system for street railways is uncertain in its operation; that it cannot be relied upon for constant service; that it cannot graduate its speed to the requirements of street traffic; and that it is extremely unsafe unless the portion of the street occupied by its tracks is given up to its use, and other streets at its crossing compelled to yield to its movements.

It is to be hoped that no construction of this system will be allowed in our city without a thorough investigation of existing facts, which will certainly prevent the consummation of any plans for the adoption of rope traction by any system yet known, with the consent of the public authorities.

The Patent Office Surplus.

A correspondent suggests that the surplus revenue of the Patent Office be employed to furnish inventors with free subscriptions to the *Official Gazette;* the writer being under the erroneous impression that the Commissioner of Patents is puzzled to know how to dispose of the accumulation of money. The truth is that the Commissioner has no power to expend a dime more than Congress directs in its annual appropriations; and the Legislature has reduced the clerical force of the Patent Office so greatly that the Commissioner is unable to transact some of the ordinary business of the office with proper dispatch. This hostile legislation is doubtless intended like other Congressional bills to damage and annoy inventors, and manufacturers who hold patents. How long the latter will permit themselves to be made the sport of the politicians remains to be seen.

An Onion Disease.

Since parasites do infest everything organic, we are not surprised to read in the *Rev. Scientifique*, January 5, 1884, that M. Joannes Chatin has found a parasite in the common onion that gives rise to disease. M. Pasteur, who has examined it, finds it similar to the parasite of mildew in wheat, but with less vitality. The affected plants, it is said, should be pulled up and burned.

PATENT applied for: Cheap burglar alarm.—Drive a headless nail into the casing over any door, and after closing the door hang a tin pan on the nail when you go to bed. That is to say, do all this if you are naturally timid and want a cheap burglar alarm that will work every time.—*Detroit News.*

Correspondence.

The Paddlefast Boat Series.

To the Editor of the Scientific American:

I have all the numbers of the SCIENTIFIC AMERICAN SUPPLEMENT containing the articles on boat building by "Paddiefast." I take the liberty of suggesting that, to make them complete, you should supplement them by a series of chapters on displacement, stability, lateral resistance, position and size of spars, center of effort, and areas of sails; illustrating them by models taken from American practice. I mention this, as I find that anything in book form is English and does not apply to American models, and is too costly for ordinary buyers. J. H., JR.

[The various subjects above suggested by our correspondent were in contemplation by Paddlefast at the time of his decease. Since then we have been hoping to find some person to take up and complete the work. We should be glad to hear from any one who is able and willing to undertake it.—ED.]

How the Exhaust became Choked.

To the Editor of the Scientific American:

The following may be of interest to some of your many readers. We have had a small locomotive in constant use for the last twelve years, bringing the logs into our saw mills; it has a pair of 5 inch cylinders with 11 inch stroke attached to an upright boiler. For the last twelve months it has been gradually losing power, or rather speed, until it got so slow that it was taking 15 hours to do the work it used to do easily in 6 or 7 hours; what seemed strange, it ran about as fast loaded as empty, and crept along with about as heavy a load as ever it did.

We observed that the exhaust was not so distinct as it used to be, and latterly got to be continuous. At various times, as opportunity offered, we faced the valves, renewed the piston rings, and did everything we could think of to improve it, but all to no purpose. We had examined the cylinders and steam chest to see that there were no blown holes between them, and to see that there were no blown holes between the steam chest and exhaust. We plugged up the exhaust ports and filled the exhaust pipe with water, but found no leak; and in driving out the plugs the water came away with a rush, showing that there was no stoppage in the pipe. We were now almost at our wits' end, but to make sure the fault was in the engine, we disconnected the driving wheels, and found, as we had supposed, that the fault all lay in the engines, as they would only go at a creep; in desperation we removed the grease cocks, tried them again, and away they went at full speed, proving that after all the fault lay in the exhaust.

On disconnecting the pipe we found the stoppage near the top, just where it entered the funnel; we found we could not remove the obstruction until we cut the pipe, when at last the grand secret was laid bare. The uptake of the boiler where the exhaust pipe goes through gets very hot, sometimes red; this had arrested a portion of the grease in passing from the cylinders, burning and soldering it hard to the pipe; this going on for twelve years had reduced the opening from two inches to little more than a quarter of an inch. We need scarcely state that after a few hours' work we had our locomotive running as well as ever it did.

BROWNLEE & Co.

Havelock, Marlborough, N. Z., 1884.

Inventors should Work like Politicians.

To the Editor of the Scientific American:

The strong arguments you have published concerning the matter of the bills before Congress affecting our patent system, should be republished in the form of a supplement, to be carefully distributed among our people. As it is, I am certain that the matter will be overlooked by many persons who would be of service at this time in opposing measures which without opposition will soon assume gigantic proportions, to the detriment of inventors and the general public. I, for one, will make good use of a large number of such supplements, and many people interested in the subject will undoubtedly do the same thing, so that the burden will not rest too heavily on a few persons.

Let Congressmen disguise themselves as patent purchasers and approach the records of the Patent Office, where the ownership of a patent exists, and they will come away satisfied that a purchaser is swindled only through his own carelessness, just as might be the case in a purchase of real estate without a search of title.

Let inventors for once come down to the level of politicians and "go to work," as they call it, and their rights will not long be tampered with by Congress.

R. M. FRYER.

New York, March 10, 1884.

[The world moves too fast, and there are too many new things each week engaging the attention, to justify the republishing of what has before appeared in our columns touching the proposed destruction of our patent system. But we can supply the back numbers containing these articles to those wishing them.—ED.]

A CORRESPONDENT of the *Pharm. Zeitung* tells another correspondent that benzoic acid and camphor can be made into a pill mass by means of powdered soap, 6 parts; water 1 part; and calcined magnesia, q. s.

The Pons-Brooks Comet.

An interesting account of the appearance of this comet, which is believed to be that of 1812, has been communicated by M. Jameson to the French Academy of Sciences. The writer is M. Trouvelot, who observed the comet on December 17 last, at 6:30 A.M., Marseilles mean time, with a telescope of 156 millimeters aperture, and an ocular magnifying eighty-five times. Seen by the naked eye, the comet appeared as bright as the stellar mass of Hercules, which it closely resembled; only at times a vague twinkle indicated that it possessed a core or nucleus. Viewed through the glass the comet plainly showed a head, coma or hair, and a tail. The general appearance was that of a long necked pear or grape stone, the round core being several degrees brighter than the nebulous hair around it, which gradually tapered off behind into the tail. The brightness of the core was estimated by M. Trouvelot as that of a star of sixth magnitude. In shape the core was not quite spherical, but slightly elongated in the direction of the tail. The hair was very bright, but as it blended into the sky its exact limits could not be very well distinguished. At first sight the head resembled a nebula with a central nucleus; but on closer inspection it appeared to be formed of two halves turned toward the sun and prolonged to form the tail. The sides of the tail, which extended opposite to the sun, also seemed to melt in the sky. The general direction of the comet was S. S. W. and N. N. E., the tail pointing in the latter line. M. Thollon has examined the spectrum of the comet at Nice, and found it to show with remarkable distinctness the three bands also given by the compounds of carbon. He concludes from his observations that the gaseous element enters largely into the constitution of the body. M. Trepied succeeded in observing the spectrum of the core on the evening of December 27, and found it as usual a longitudinal straight continuous band, with a notable increase of light at its intersections with the three carbon bands. He considers it probably due to reflected solar light, but has not yet seen the Fraunhofer lines observed by Mr. Huggins in a photographic spectrum of the great comet of 1881. The brightness of the core greatly increased from December 15 to 25, but appears to be fixed now. The tail, too, which developed rapidly during the latter days of December, is now of constant length.

Bright's Disease.

Referring to what was printed on this subject in the SCIENTIFIC AMERICAN of February 16, Dr. Alex. De Borra, of Crystal Springs, N. Y., writes that, after years of practical test of the milk diet for Bright's disease, he has a long list of cases in which he has made perfect cures. Great care is taken to get absolutely pure skimmed milk, from healthy and well fed cows, and no other food of any kind is given after the patient can bear five pints of milk a day. Up to this point, and until the stomach is able to take care of so much, is found to be the most trying period in this treatment, but no other medicine is given, and hand and hair-glove rubbing is daily administered.

Another correspondent takes exception to the claim made, that no drug of any therapeutic value in that disease has yet been discovered. In support of his assertion he sends us a recipe which he claims has effected a cure in Bright's disease, as well as in dropsy, in every case in which it has been tried during the last fifteen years. He recommends the drinking of an infusion of the dry pods of the common white soup bean or corn bean. When the latter cannot be readily obtained the pods of the "snap short" bean will answer, and even the Lima beam, though the latter is of inferior strength. The recipe is as follows: "Take a double handful of the pods to three quarts of water; boil slowly for three hours until it is reduced to three pints. Use no drink of any kind but this, the patient drinking as much as he conveniently can; it may be taken either hot or cold."

Acetate of Soda Car Heaters.

A new method of warming street cars has been on trial for several weeks on the De Kalb Avenue line in Brooklyn. About seventy cars have been fitted up with the appliance, which is a very simple one and does not encroach on the seating room for passengers. Two pipes run under the seats on each side, charged with a composition of acetate of soda, which at each trip is heated by a jet of steam sent through from a stationary boiler at the stable. The compound being heated is dissolved into liquid, and upon cooling throws out into the car the heat stored in it. This heat is pleasant and moist, and, without being intense enough to be disagreeable, is sufficiently strong for passengers to enjoy with ordinary out of door wraps, the temperature by actual record being maintained at 40 degrees higher than that outside the car. Thus, if the thermometer is down to 20 degrees above zero, the average temperature of the cars is kept at 60 degrees above.

A WRITER in the London *Garden* says he has discovered that grape vines in houses do better under rough rolled glass than under clear glass. The two most striking things he observed were the good quality of the fruit, and especially its color, and the health of the foliage of the vines, which was less affected by red spiders than any he had ever known before. The green state of the foliage before and after the fruit was ripe he attributed solely to the subdued rays of the sun upon the leaves through the rough plate glass, which obviated the necessity of giving air, thus trying the leaves less than they would be otherwise.

The Gum Arabic Supply Cut Off.

Gum arabic comes almost exclusively from the Soudan, and, owing to the operations of El Mahdi, there have been no receipts of any consequence for a year past. In confectionery it makes about 30 per cent of the best quality of gum drops, marshmallow, and jujube paste, and the Government envelope manufactory at Hartford, Conn., is said to use a ton of gum arabic weekly. The annual supply from the Soudan has heretofore been from 20,000 to 25,000 bags, of 400 to 600 pounds each, and there is usually a stock held in London about equal to one year's receipts. This reserve is now about exhausted, and the gum has been steadily advancing in price from the ordinary figures of 8 to 10 cents a pound until it now commands from 30 to 50 cents, according to quality.

The Vatican.

A writer in one of our contemporaries concludes that this word is often used by many who do not understand its import, and he proceeds to explain. The term refers to a collection of buildings on one of the seven hills of Rome, which covers a space of 1,200 feet in length and 1,000 feet in breadth. It is built on the spot once occupied by the garden of the cruel Nero. It owes its origin to the Bishop of Rome, who, in the early part of the sixth century, erected a humble residence on its site. About the year 1160 Pope Eugenius rebuilt it on a magnificent scale. Innocent II., a few years afterward, gave it up as a lodging to Peter II., King of Arragon. In 1305 Clement V., at the instigation of the King of France, removed the Papal See from Rome to Avignon, when the Vatican remained in a condition of obscurity and neglect for more than seventy years. But soon after the return of the Pontifical Court to Rome, an event which had been so earnestly prayed for by poor Petrarch, and which finally took place in 1376, the Vatican was put into a state of repair, again enlarged, and it was thenceforward considered as the regular palace and residence of the Popes, who one after the other added fresh buildings to it and gradually encircled it with antiquities, statues, pictures, and books, until it became the richest depository in the world.

The library of the Vatican was commenced 1,400 years ago. It contains 40,000 MSS., among which are some of Pliny, St. Thomas, St. Charles of Borromeo, and many Hebrew, Syrian, Arabian, and Armenian Bibles. The whole of the immense buildings composing the Vatican are filled with statues found beneath the ruins of ancient Rome, with paintings by the masters, and with curious medals and antiquities of almost every description. When it is known that there have been exhumed more than 70,000 statues from the ruined temples and palaces of Rome, the reader can form some idea of the richness of the Vatican. It will ever be held in veneration by the student, the artist, and the scholar. Raphael and Michael Angelo are enthroned there, and their throne will be as enduring as the love of beauty and genius in the hearts of their worshippers.

Gas Leakages.

An indicator of gas leakages has been constructed by Mons. C. V. Jhan, and is described in the *Revue Industrielle*. The apparatus consists of a vessel of porous earthenware, such as the porons cell of a galvanic battery, set upside down, and closed by a perforated India rubber stopper. Through the hole in the stopper, the inside of the vessel is connected with a pressure gauge containing a little colored water. The vessel can be exposed to the air of an apartment where a leak of gas is suspected; or a sample of the air may be contained in a bell glass inverted over the porous cell. The diffusion of gas through the earthenware raises the level of the water in the pressure gauge; and when the latter is properly graduated and proportioned to the capacity of the cell, exact and delicate indications may be obtained in a simple manner. This species of diffusiometer is so sensitive that when an Argand burner is gradually turned down until it is extinguished, the instrument, if held above the burner, will show a considerable rise of the water in four or five seconds. If held over an ordinary burner, turned on just sufficiently to be ignited, the liquid rises very rapidly. When the instrument is graduated in millimeters, a volume of one-half per cent of gas in a room may be distinguished by it. An example is afforded by a case of sickness, which, in the opinion of the medical attendant, was due to gas poisoning. Some doubt arose on the point, because gas was not laid on to the house. The diffusiometer was brought into requisition, and showed the presence of gas, the source of which was afterward found in a broken main 3 meters distant from the house. A modification of the same instrument is made, whereby the sensitive portion is adapted for permanent exposure in any place difficult of access—such as the ceiling of a theater or public building, where gas might be expected to collect; the indicating portion being fixed anywhere within view.

Blindness of Congressmen.

"Thieves can be dealt with without robbing the inventor or punishing the public," says a Philadelphia correspondent, in concluding a letter protesting against the blindness of Congressmen in refusing to see the true position of patentees before the law. Attention is also called to the fact that foreign governments have of late been hastening to encourage inventors by enacting patent laws mainly modeled after the United States system, even Spain granting patents for twenty years.

A Triangular Rule.

It is not an easy matter to lay out a straight line—or rather two parallel lines—on a shaft in the exact line of its center by an ordinary straight-edge or rule. There is no means of knowing that the rule is held exactly in line, and the marks for a keyway, for instance, may be parallel with each other but diagonal relative to the longitudinal center of the shaft. A simple straight-edge may be made by any machinist having access to a planer, that will insure exactness without extraordinary care. Take a piece of inch square bar steel ten inches long, anneal it, put it on the planer and plane two adjacent sides, and then plane away the two other adjacent sides, thus leaving it of triangular or L section, the sides perhaps three-sixteenths of an inch thick, or a quarter of an inch thick, beveled on the inside so that the edges will be thinned down to one-sixteenth of an inch.

If this method of producing an angular shell by the wasting of most of the block of steel appears unnecessary, a piece of plate steel three-eighths of an inch thick, two inches wide, and ten inches long may be bent to the angle, the corner being upset so as to get a perfectly square corner in finishing. It is evident that such a tool would be very convenient in laying out lines on shafts and other cylindrical bodies, and also on the inside of bored holes. Of course, two or three varying sizes of the tool would be desirable.

A modification of this tool may be made for leveling purposes, as the leveling of shafting, the testing of the parallelism of shaft and crank pin on steam engines, and for similar purposes. In this adaptation the tool is simply a block, say two and a half inches or three inches square, and six, seven, or ten inches long, with perfect planed sides and a V planed out of one side so deep as to have a bearing only on its edges or inside when placed on a shaft of any size from one and a half to six or more inches. With this tool, having an ordinary spirit level laid on its top, there is no difficulty in leveling, and no danger of having the spirit level mislead by not bearing exactly on the center of the shaft. This recessed V block need not be of steel; ordinary cast iron is good enough, only it must be planed and finished true on the V-recessed face and the opposite face—the top.

Water in Boilers.

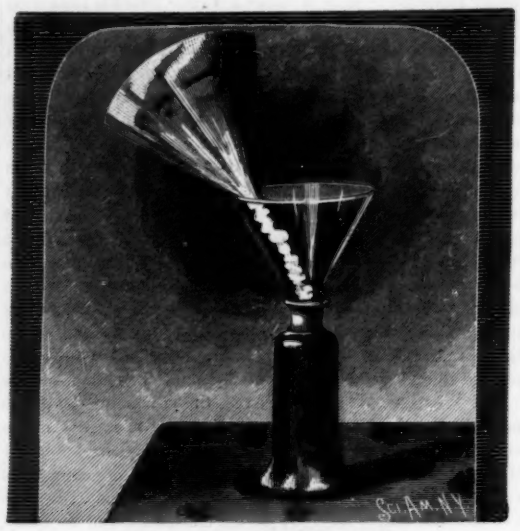
The danger of allowing water to assume the spheroidal condition in steam boilers is generally recogaized; and M. Melsens has investigated the causes which conduce to this state. He has found that when the shell of a boiler is roughened with many points, water boils at the same temperature as that which in a perfectly smooth boiler will produce the spheroidal condition. The demonstration of this fact has been shown by the following arrangement: A dish representing the bottom of a boiler is divided into two equal parts, one of which is made perfectly smooth, while the other is covered with little pointed metallic cones, soldered to the plate. The dish is raised to a uniformly high temperature by a gas furnace, and then a quantity of water is poured simultaneously into both compartments, rising high enough to just cover the points of the cones. In the smooth compartment the water will pass into the spheroidal condition and not enter into ebullition; in the other, the ebullition will be lively so soon as the water covers the points of the cones. The same phenomenon occurs when the water has, by long boiling, been previously purged of its contained air. It remains to be proved whether this experimental fact can be utilized in the construction of boilers, in order to suppress or diminish the disasters arising from overheating.

What will Burst a Gun.

Some strangely twisted pieces of gun barrels exhibit, in a most interesting fashion, says the Philadelphia *Times*, the vagaries of overtasked gun barrels. The specimens are parts of some guns burst by Capt. Heath, of that city, during some protracted experiments with various weapons. Five of the barrels were burst because a ball was "stuck" near the muzzle in each case, two gave way because about four inches of snow was put in the muzzle, two were burst by reason of having some wet sand at the muzzle, and three were ruptured by mud at the muzzle. Sportsmen often scoop up a little mud or sand unconsciously, bang away at game, and are then astonished to find the gun with a ragged and shortened barrel.

ANOTHER CURIOUS CASE OF FREEZING.

The curious and beautiful case of freezing which was illustrated in the SCIENTIFIC AMERICAN a few weeks ago has called forth a number of letters from our correspondents, and one gentleman, Mr. Koerner, of Wisconsin, has forwarded to us a photograph which we present in the accompanying engraving. In the letter which came with the photo he said: "The bottle contained a solution of photosulphate of iron. I filtered the liquid until the bottle was quite full, and the



STEM OF ICE AT FILTRATION.

next morning, to my suprise, I found it in the condition shown. The white line connecting the filter with the bottom of the funnel is a solid piece of ice and has the coarse shape of rock candy. Everything is solidly connected, though the ice does not rest on the side of the funnel, but in one solid stick running up and holding the filter in place." The filter of course is one of the ordinary paper filters commonly used in laboratories; this unexpected termination of Mr. Koerner's filtering operation affords a very pretty illustration of the wonderfully expansive power of ice.

OIL ON TROUBLED WATERS.

Thomas Stapleton's translation of Bede's "Historia Ecclesiastica" was published in 1565. Bede was born 672 A.D., and died 735 A.D. In one portion of his work he states that when a certain priest was sent into Kent to fetch King Edwine's daughter to be married to King Oswin, he so appointed his journey as to return with the lady by water. Upon beseeching the prayers of the bishops he was given a pot of oil, told that he would meet a tempest and contrary wind, and that he was then to cast the oil into the sea. All happened as the bishop had foretold, and "in this distresse the priest at the length remembering the bishop's wordes, toke the oyle pot, and did caste of the oyle into the sea, which being done . . . the sea calmed, the bright sonne appeared, the ship passed on with a most prosperous viage." Here it will be noted the oil not only calmed the sea, but changed the weather and brought out the sun.

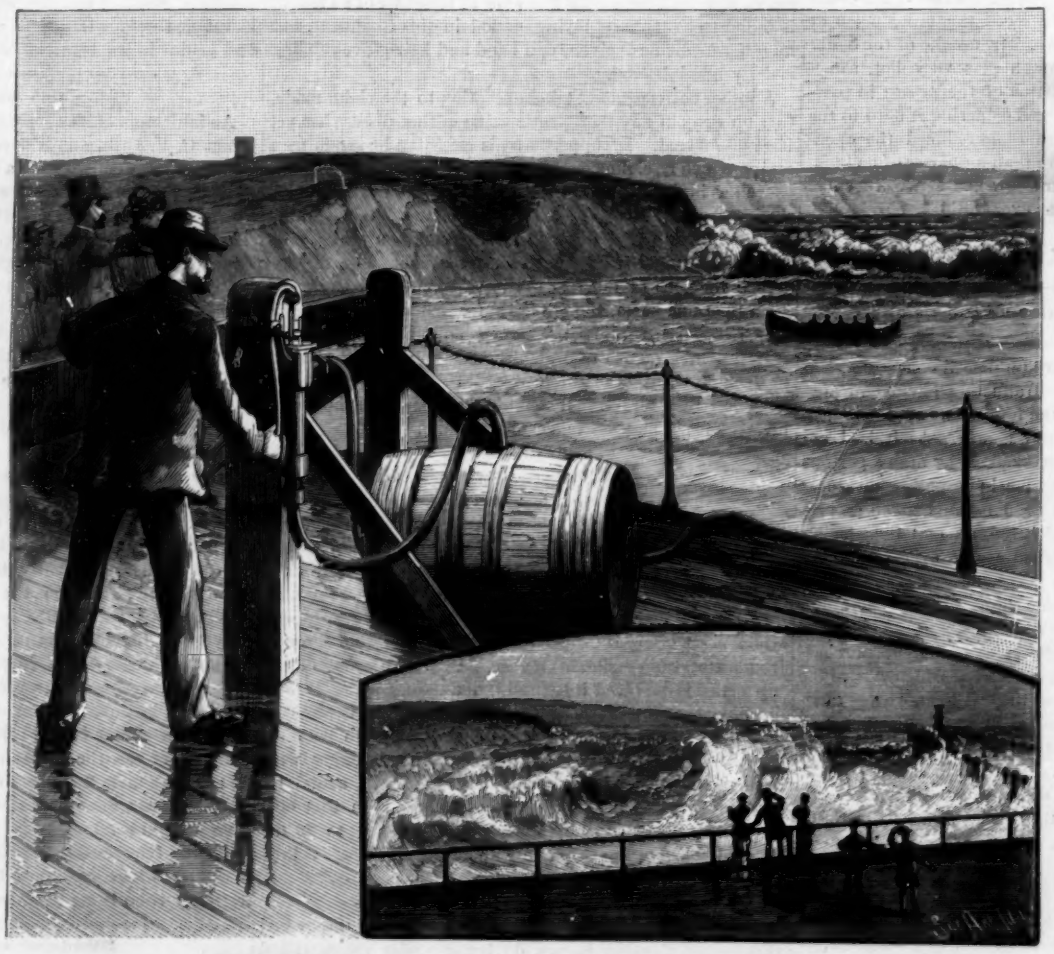
Various other instances are reported in which the saving of ships was believed to be directly due to the diminished force of the waves caused by pouring oil in the sea.

On October 8, 1880, a three ton boat sailed from Montevideo for Naples, the voyage being undertaken, not in a foodhardy spirit, but to test the value of a little oil on rough water. The olive oil used was inclosed in small bottle-shaped bags each containing about half a gallon. When it became necessary to lie to in a gale, a large bag was attached to the bow of the boat and thrown overboard. This served as a floating anchor, or drag, and kept the boat's head to the wind. Two small bags were then thrown over, one fore and one aft. Each bag had a small hole through which the oil slowly escaped. Although the oil did not reduce the size of the waves, it was claimed to render them comparatively harmless by preventing them entirely from breaking.

On February 4 last, the ship Jan Mayen left Dundee for St. Johns. She met a heavy storm that smashed the binnacle, carried away the compasses and part of the bulwarks, and finally threw her on her beam ends. As a last resort to save his ship, the captain tried the oil experiment. Three bags were filled with oakum saturated with oil; one bag was hung over the weather bow, another amidships, and a third on the quarter. In a short time the sea ceased to break over the ship, which soon righted. The oil lasted until the next morning, when the sea had considerably calmed down.

On January 26, the ship Lauderdale, from Junin to Hamburg, was struck by a heavy sea and soon began to make water. The next morning the captain of the Medea lowered a boat to go to her assistance, but it was capsized and all on board lost. If the boat had got only a little nearer the Lauderdale she would have been in smooth water, as on board the latter vessel they were pouring oil into the sea through a pipe in the forecastle, and this had a wonderful effect on the water all around. In view of this statement, the fact that a boat should be lost when oil was actually running into the sea from the forecastle of the ship looks rather bad for the oil theory. During the following morning the crew of the disabled vessel left in their own boat and got on board the Medea. Three trips were made in the boat, which was supplied with a can containing about five gallons of oil, from which a stream about the thickness of a pencil was allowed to flow into the water, and the result was that the sea was calm and no water broke on board.

The accompanying engraving represents Folkstone Harbor, England, where a method of putting the oil upon the water when needed has been recently effected. From each side of the South-Eastern Railway Company's pier had been laid under water several hundred feet of lead pipe about one and one-quarter inches in diameter. The pipe is furnished with a series of upright branches eighteen inches high at intervals of about one hundred feet, each branch terminating in a valve and a brass rose like that of a watering pot. The lead pipe is connected at its shore end with a force pump placed on the pier. By means of the force pump oil is driven through the pipe and out of the small perforations in the roses under water. On January 29, 1884, the plan was tested, about one hundred gallons of oil being pumped through the pipes. Soon there was a wide stretch of rolling sea, only at the edges of which the waves broke, and in the center of which a life boat rode easily. Seal oil was used. A second experiment was made at the same time, consisting of firing shells filled with oil, which, when the shells burst, spread itself over the water. The shells were simply oil flasks, each being provided with a fuse so timed as to burst when required. Our engraving, which is from some English pictures taken on the spot, purports to represent the condition of the water both before and after the application of the oil. On one side we behold the sea lashing itself into a fury wherein no small boat could live. On the other side is seen the appearance of the same water after a little oil has been discharged thereon. All is calm and peaceful, and the boat is observed to be gliding, as it were, over a surface as smooth as a lake in a summer day. This is fully equal to the statement above made by Bishop Bede more than a thousand years ago, and so far as the oil virtue is concerned, one story is about as true as the other.



EXPERIMENT WITH OIL ON TROUBLED WATERS.

THE TWELVE THREAD PLUME BIRD.

This beautiful bird (*Epimachus albus*) was first brought into notice through the investigations of Rosenberg. It greatly resembles a bird of paradise, and might easily be mistaken for one. Its length is thirty-two centimeters, the wings sixteen, and the tail eight centimeters in length.

Around the neck is a collar, and there is a long cluster of feathers on the breast. The velvet-like feathers of the head, neck, and breast are black, changing into green and violet; the elongated feathers on the side of the breast are emerald green. The wings and tail are a beautiful violet color. The most remarkable feathers are the long, silken plumes at the side, the longest of which reach over the tail; six of the lower ones on each side are furnished with long, thread-like prolongations, about as large as a horse hair, which are golden yellow at the root, and the remainder brown. The eye is scarlet, the bill black, and the foot yellow.

In the female the under part of the neck, upper part of the back, and velvet-like feathers of the head are bright purple, the under part of the back, the wings, and the tail rusty brown. The whole under side is grayish white, or bright yellow brown ground, with small black diagonal stripes. The young birds resemble the female; as they grow older the neck becomes gray, at the next moulting they become yellow on the under side, and the clusters of feathers at the sides make their appearance; after the third moulting the elongated threads, which were straight, are curved outward.

Rosenberg says that a large number of mutilated skins of these birds are carried every year to Mangkassar and Ternate, but not a single collection in Europe has a perfect specimen. Until now all descriptions and pictures have been incomplete and incorrect.

During Rosenberg's stay on the island of Salwati, in the month of August, 1860, he was so fortunate as to obtain six of these incomparably beautiful birds.

They live in small troops or families. They are natives of New Guinea and the island of Salwati. They prefer mountainous regions. In the crops of the dead birds Rosenberg found fruit mixed with the remains of insects.

At the brooding time the bird erects the feathers forming the collar, and opens the elongated side feathers into a beautiful fan shape.

According to Wallace, these birds visit trees in bloom, especially the sago palm and plantain, in order to suck the nectar from the flowers. They rarely stay but a moment upon one tree; their large feet enable them to climb quickly around among the blossoms; then they fly with great rapidity to another tree.

Wallace asserts that the dead birds that he examined had a brown juice in their crops, resembling the nectar of flowers. An imprisoned bird of this kind ate eagerly moths and melons.

Nothing is known about their nest or eggs.—*From Brehm's Animal Life.*

THE TWELVE THREAD PLUME BIRD.

Curious Facts about Snails.

In a native state, snails generally live about two years, though they often go on living for much longer periods. Every autumn, as the cold weather comes on, they grow torpid, and retire to a hole in the ground or in the rocks, where they hibernate just like bears or dormice. In the hibernating condition they sleep very profoundly, only breathing to a very slight extent, while the action of the heart is all but entirely suspended.

Snails will sleep away whole years together without dying when in their torpid condition. A writer in the *Gentleman's Magazine* mentions a case in which two garden snails remained alive, fastened by their own mucus to a wall, with no food or drink for thirty-two months at a stretch; and an instance has been recorded where a desert snail from Egypt passed four years under similar circumstances, gummed to a card in the British Museum. Even during their most wakeful periods snails breathe in a very slow and leisurely fashion. If you watch a garden snail for a few minutes, as he walks deliberately along the top of a brick wall, you will see him every now and then lazily open and shut a sort of hole or gap on his right side, which gives him a queer, yawning appearance.

This hole is really the mouth of his lung or pulmonary chamber—about as simple a form of breathing apparatus as any to be found in the whole circuit of the animal kingdom. It consists merely of a sac or hollow in his body, with a mouth that can be irregularly opened and closed at pleasure, but without any mechanism for respiration, that is to say, for inhaling fresh air and expelling the superfluous carbonic acid. The veins are merely disposed around the walls of the pulmonary chamber, and whenever the animal opens the little gaping mouth a fresh stock of the pure outer atmosphere is taken in, exactly in the same way as when we air a room by opening a window. The snail then keeps this air inclosed in his simple lung till his blood has absorbed all the available oxygen and replaced it by carbonic acid, after which he once more opens the mouth and allows the air a second time to renew itself by mere atmospheric diffusion. The effect is just the same as if we ourselves were merely to open our mouths every three minutes or so, and let the air get in of itself, without breathing in any way. Of course such a rudimentary type of respiration is only possible in a very inactive and sluggish animal. Active creatures require much more oxygen to keep the internal fires burning brightly, and the engine working up to full vital speed. Garden snails crawl by means of successive expansions and contractions in the broad muscular under surface of the body, technically described as the foot.

As the snail walks, he keeps pushing out in front of him four curious retractile feelers or tentacles, commonly called his horns. Two of these horns are long, and two short, the longer pair being the upper ones. Both can be withdrawn by being turned inside out, like the finger of a glove that is pulled off backward. At the end of the long pair of tentacles are two small black spots, the eyes, which are very rudimentary in the garden snail, and apparently only possess the power of distinguishing light from darkness, without any distinct vision for shapes or colors. This is a very interesting fact from the evolutionary point of view, as the highest marine shell fish belonging to the same group, such as the strombs or wing whelks, have in the same position well developed eyes, as perfect as those of many fishes, with a full complement of retina, crystalline lens, aqueous humor, and vitreous humor, exactly as in the human eye. The regular gradation and similarity of position show that these marine carnivorous snails have developed a true and highly evolved organ of sight out of the tiny black pigment specks of the common creeping univalves, and the process is no doubt largely connected with their extremely active habits, and their singular power of jumping through the water by successive bounds or leaps.

It has long been noticed that the eye is always most highly developed in the most locomotive animals, and almost or completely wanting in the most sedentary. The converse side of this principle is well exemplified in the oyster, the young fry of which, during their early locomotive stage, have a pair of distinct black eyes to guide them in choosing their future home; but as soon as they settle down for life on some ledge or bank in complete laziness, the eyes die away, and the animal passes the rest of its existence in complete and contented blindness. The eye stalks and eyes of snails possess the faculty of reproduction, after accidental injury, so common among the lower animals. If the tentacles are cut off with a pair of scissors, they will grow again in about a fortnight. This habit of reproduction seems to depend, as Mr. Herbert Spencer has pointed out, on the same principle as that which governs growth and development. The entire animal shape is the one which satisfies the natural polarities of the units which compose it; like a broken crystal, the animal tends to restore its own original and normal form by the inherent physical attributes of the parts which go to make it up. As the snail walks about he keeps pushing forward and withdrawing his horns, in proportion as he finds his way clear before him or otherwise. The manner in which he does so shows at once that he depends almost as much on touch as on sight to guide his slow and tentative movements. He can, however, hear a little, for he has a sort of rude ear, with a tiny calcareous pebble or otolith, suspended in it, near the base of the tentacles. He can smell, too, and there is no doubt that by smell mainly he is attracted toward the particular food-stuffs that please his vegetarian palate.

All snails are hermaphrodite, that is to say, each individual is at once male and female, but they pair together like ordinary sexual animals. One tropical Brazilian snail lays an egg as big as a pigeon's, covered externally with a hard calcareous shell. The garden snail, in his younger days, is mostly devoured by thrushes and blackbirds. He has comparatively few other enemies, except toads, who eat him freely, and hedgehogs, who are not averse to him while his shell is still soft and easily crushed by the small teeth of his nocturnal aggressor. The smaller kind of snails are less protected, and are much more largely eaten both by birds and by the lesser quadrupeds. Even the glow worm is a great snail eater, living as a rule off this kind of food alone. The big Roman snail, on the other hand, has too stout a shell in his adult state for almost any ordinary bird or mammal to masticate readily, still he falls a victim, in Southern Europe at least, to the culinary tastes of man himself; for the *escargot* is a favorite dish with French *chefs*, and in the market place at Toulouse large basketfuls are exposed for sale every day. They are dressed with melted butter in the Paris restaurants, and should be tasted by every amateur of novelties in cookery. The Roman snail has even, in Southern Europe, a medicinal value. French doctors prescribe *sirop d'escargots* largely for pulmonary complaints, and the mucus is supposed to be an excellent substitute for cod liver oil.

An Outfit for Salmon Fishing.

"Old Izaak," of the *American Angler*, having received an invitation to join a party salmon fishing next summer, and not being able to buy a whole outfit, commenced by making his own flies. He had been out of practice for a year or two, but after completely spoiling a dozen got his hand in and succeeded tolerably well: though the flies he made were not as beautifully and artistically tied as those offered for sale, they were made sufficiently strong, and could not be pulled or snapped off. This part of the outfit was therefore the least expensive. Our old angler wanted to be provided with first-class tools to work with, and could not afford to buy what was needed.

He had a Newport split bamboo bass rod, which it was thought might answer as a foundation for a salmon rod. This rod he had put together himself, having procured the ferrules, mountings, and the bamboo strips from a dealer; he also had an extra long and stout bamboo tip, and sent the rod with the tip to the dealer, requesting him to make an extra joint same length as the tip. It came back, *not* a perfect salmon rod, but such as he could cast a long line with, and handling it feel a confidence of killing any fish he might be fortunate enough to hook.

Being well fixed for rods and reels, he went on completing the outfit. "And now," he says, "comes the expensive part. The line cost ten dollars; the gaff, four; the wading pantaloons, fifteen; the gut leaders—ah! those expensive little traps I have only commenced with. I got samples from several dealers, costing from seventy-five cents (worthless affairs) to the nine foot single gut, for which I paid two dollars each. They are warranted to stand a test of seven pounds strain. One hank of salmon gut cost four dollars; one dozen of sample flies, six varieties, cost seven dollars; head net and mosquito bar, three dollars; rubber blanket, four dollars; and heavy blue blanket, six dollars.

"Now, there are a number of knickknacks yet to be secured; but this will suffice to give the angler some idea of the cost of a salmon outfit of very moderate and economical proportions. But if you wish to dance a hornpipe in a rapid river with a long, heavy rod held aloft, with the butt resting against your stomach, and a fifteen or twenty pound salmon dancing Juba and jumping Jim Crow at the end of your line, while the perspiration rolls down your face in streams, and mosquitoes and black flies are playing their distresses to you, and you think it fine fun and glorious sport, just do it like a man, and never mind the cost, provided you bring the fish to gaff. Truly, getting your tackle and traps ready, and the anticipations, are not the least enjoyments of the angler, and the great consolation is given, even to the grumbler, that once outfitted, you have never again (provided you know how to care for tackle) such an expense to undergo. Life is short, and we have but one life; the angler is the true philosopher, and gets all the good out of life he can; because he more than any other knows how to do it."

Sulphuric Acid.

As we all know, this acid is one of the most commonly used for technical purposes; it also forms an important part in the chemical department as used in dye houses, print works, and the manufacture of dyes. The large and constantly increasing consumption renders it necessary that, at least for many purposes, it should be of a comparatively pure nature. Ingredients which happen to be found in sulphuric acid, during the process of manufacturing, may not be of any consequence for some purposes, but will for others. In the dye house and color-mixing room it is required that the acid used should be of some degree of purity. It should not contain any arsenic, sub-nitric or sulphurous acid, nor any chlorine; which ingredients may, more or less, act injuriously on the colors.

For the preparation of indigo paste we require, without doubt, a product which should be entirely free from the above ingredients; and although manufacturers may wish to deal fairly with the consumer in every way, it may sometimes happen that one or more of the above impurities are found in it. Without special test they cannot be detected, and it is only found when color and dye are injured by it; that is, when it is too late. It is, therefore, advisable to always test purchases of sulphuric acid for their purity, and get convinced that it is in such a condition that it will not injure the product to be made. A simple test is for this purpose of great advantage, and the following method will be of some use in places where no chemist in employed:

A small portion of the sulphuric acid is evaporated on a platinum sheet, which is subsequently brought to a red heat. Good sulphuric acid should not leave any residue; if there is any, it is generally sulphate of potash, or soda, or even lead. These are derived from the manufacture, and cannot be classed among adulterations. We may say here that on account of the cheapness of the sulphuric acid it never is willfully adulterated, but *may* contain many foreign ingredients.

A little sulphuric acid is diluted with water and a few drops of concentrated muriatic acid added; if the solution, which was clear before, becomes milky, it indicates the presence of lead, which can be more safely identified by letting a current of sulphureted hydrogen gas pass through the liquor. If lead is found in sulphuric acid, it will be a means of trouble in darkening and injuring delicate shades of any color.

Another ingredient which is often found in sulphuric acid, particularly such products as are made from pyrites, is arsenic. For the manufacture of indigo paste, which requires much sulphuric acid, it is especially required that the acid be entirely free from arsenic, and also nitrous acid and sub-nitric acid. Arsenic is detected by the so-called Marsh test. If mixed with water and granulated zinc, hydrogen gas is liberated, which should not contain any trace of arsenic. The hydrogen gas is ignited, and the flame allowed to strike a cool porcelain plate, on which, if arsenic is present, metallic arsenic is deposited.

Sub-nitric or nitric acid may be detected by throwing a small piece of copperas in the questionable acid; if it shows a brown coloration where it touches the liquid, the presence of the above impurities is indicated.

Chlorine or muriatic acid, also injurious for many purposes, is detected by adding a few drops of nitrate of silver into the diluted sulphuric acid; a precipitate or a milky appearance of the mixture shows the presence of chlorine or muriatic acid.

Sub-nitric acid, derived from the manufacture, is shown by adding iodide of potash and starch mixture to the sulphuric acid; a blue coloration shows sub-nitric acid.—*Oil and Colorman's Journal.*

Red Sunsets and Precipitation.

The readers of the scientific journals have no doubt observed that the prevailing explanation for the red sunsets and colored sky, during the past few months, is that of chromatic diffusion of light by volcanic ash particles. There are some apparent incongruities as pointed out by Prof. Proctor and others, but we believe that the established physical laws will permit a satisfactory solution to the phenomena, assuming volcanic matter as the cause.

The object of this article is to notice what seems to the writer as a probable connection between the conspicuous sunset colors and the excessive cloudiness and precipitation during the last month or six weeks. Let us amplify the "ash theory" somewhat, and briefly mention the more important points to serve as a basis for our secondary considerations. Matter ejected from volcanoes of such proportions as the recent eruption assumed must become finely divided, in much the same manner as water is reduced to spray in being discharged with great force from a nozzle. When thus discharged into the atmosphere it will obey, approximately at least, the laws of detritus in water; it will be transported proportionately to sixth power of the velocity of air currents, and it will tend to become stratified, the larger particles forming the lower, and the finer particles the higher, strata.

With this distribution of particles varying in fineness from those capable of taking up and diffusing the red rays to those capable of diffusing the other respective parts of the spectrum, it is easily seen that the observed phenomena would result. Thus, during the middle of a clear day on looking toward the sun we see a white or yellowish diffused light, resulting from the nearly equal intensity of the different parts of the spectrum; but at sunrise or sunset, as the sunlight comes more obliquely to the observer, the red and orange colors predominate. On looking into the higher strata we observe the green, and near the meridian, or to the part of the heavens opposite the rising or setting sun, even the rich violet.

With regard to precipitation, we must recognize Mr. Aitkin's discovery and theory, viz.: that clouds and other forms of precipitation occur by virtue of the solid particles of matter suspended in the atmosphere serving as nuclei upon which the aqueous vapor is condensed. The supply of this solid matter in the aggregate is nearly uniform, but if an excess occurs from any cause we should expect a larger precipitation for the same hygroscopic state of the atmosphere. This conclusion, we believe, has been verified during the past two months in meteorological observations. It might be argued that the cloudiness and rain have not been evenly distributed, as would be expected if caused by the settling of the ash particles. But in what has been said no regard is taken of the various causes for an unequal distribution of the matter and the common conditions governing storms. We should expect weather records to show the greater precipitation in regions where the sky colors have been most conspicuous. The writer has no data for verifying this, however.

The above is advanced rather as a suggestion than as an exposition, with a hope that it may stimulate a more exhaustive study of this connection, if such connection there is.

W. H. HOWARD.

Fresh Paint.

The current belief among householders that the smell of fresh lead paint is noxious is founded on pretty general experience, but is opposed by the belief, equally current among chemists, that lead compounds are not volatile. A fact recently brought to our notice seems to support the domestic theory. The basis of the useful and popular luminous paint is known to be sulphide of calcium. Now, this compound, when unprotected by varnish, glass, or some other impervious substance, is slowly acted on by the acids of the air and sulphureted hydrogen is evolved, which blackens lead paint. This is well known, and can easily be avoided by proper protection of the paint. But the curious thing is that unprotected luminous paint is found to be perceptibly blackened by the fumes from fresh lead paint. There seems to be only one possible explanation of this—namely, that a surface freshly covered with lead paint does actually emit some volatile compound of lead. We believe that many physicians could confirm this view from their own observations in regard to newly painted houses.—*Lancet.*

Preparing Liquid Carbon Dioxide.

The usual Amherst experiment, as an illustration in the lectures in chemical physics, of condensing carbonic dioxide, by the Thilorier apparatus, was this year "written up" by an enterprising reporter, in a style which Professor Pond says is in the main correct as to the facts, although it is decidedly sensational. The experiment has been regularly conducted at Amherst for twenty years, and although laborious and troublesome, is not considered dangerous, but the reporter says:

"So difficult and dangerous is the undertaking by this process that it is forbidden by law in all countries except the United States, and probably Amherst is the only college where it is undertaken. Two iron cylinders are used, one the generator, the other the receiver. They resemble howitzers fitted with strong iron bands and peculiar valves. Bicarbonate of soda and sulphuric acid are placed in the generator in such a way as not to mingle until the cylinder is securely closed. The union of the substances generates carbonic acid gas with terrific pressure (being about a ton to every four square inches), and this passes into the receiver, which is packed in ice and salt. The process is repeated twelve times, until the gas in the receiver is forced by pressure and cold into liquid form. When this is allowed to flow out it evaporates so rapidly that it forms a solid, snow-like mass, having the surprising temperature of 140 degrees below zero. Mercury poured upon it freezes instantly, and the effect of touching it is about the same as handling a red hot coal. The great danger in the experiment arises from the tremendous pressure—and thus the liability of a bursting cylinder."

Solid carbon dioxide evaporates without melting, for its melting point is —85° Fah., and its own evaporation keeps it at —125° Fah. So cold is it that, with prompt handling, even mercury in a red hot platinum dish may be frozen solid by solid carbon dioxide in ether.

Metallization of Wood.

Rubennick's process steeps the wood in a bath of caustic alkali, for two or three days, according to its degree of permeability, at a temperature between 164° and 197° F. The wood is then placed in a second bath of hydrosulphate of calcium, to which is added, after 24 or 36 hours, a concentrated solution of sulphur. After 48 hours the wood is immersed in a third bath of acetate of lead, at a temperature between 95° and 122° Fah., where it remains from 30 to 50 hours. After a complete drying, the wood thus treated is susceptible of a very fine polish, especially if its surface is rubbed with a piece of lead, tin, or zinc, and finally finished with a burnisher of glass or porcelain. It then looks like a metallic mirror, and is completely sheltered from all the deteriorating effects of moisture.—*Les Mondes.*

Illuminated Bodies in Dusty Air.

In 1870 Dr. John Tyndall described the remarkable dark plane or dust-free space which rises from a hot body in illuminated and dusty air, and gave two explanations of it. Other explanations were given by Dr. Frankland, Lord Rayleigh, and others, the latter discovering that a cold body gave a similar downward plane. Professor O. J. Lodge and Mr. J. W. Clark, at the Physical Society on February 16, discussed the subject in the light of experiments made by them, and showed reasons for rejecting all these explanations. They have observed that the dark plane in question rising from a hot body is only a prolongation of a well defined dust-free couch or layer of air surrounding the body; and this layer is really the thing requiring explanation, the plane being merely the upcarrying of portions of this coat by convection currents. The dark layer is found to increase with the temperature of the body, becoming very thick at a temperature of, say, 100° Cent., but is very narrow for temperatures only a few degrees above the air. The authors have found the coat on bodies of various sorts and sizes, such as mica plates, pieces of copper, zinc, carbon, selenite, potash, silver, chalk, and paper. These bodies were examined by inclosing them in a box filled with smoke of tobacco or ammonic chloride, the latter when a decidedly volatile smoke was desired. Magnesic oxide smoke was used when a non-volatile and incombustible smoke was required. The beam of an electric lantern was projected on the body. Professor Lodge also succeeded in obtaining the dark layer from the surface of an iron wire in water tinged with rouge. Glass gives a clear but thin coat; rock salt a wide one. The cause suggested by the experimenters is that molecular bombardment and gravitation both assist in producing the plane; the dust particles being driven away from the hotter surface of the body. It is interesting to remark in this connection that Mr. Aiken, who will be remembered for his researches into the cause of fogs, recently read a paper to the Royal Society of Edinburgh on similar phenomena, and he shows that a room heated by a stove will get smokier and dustier on the walls than one heated by a fire, because the air is hotter than the walls in the stove heated apartment, and the walls are hotter than the air in a fire heated room.

Shifting of the Mississippi Channel.

Capt. Marshall, of the U. S. Engineers, on the Mississippi River Commission, in charge of its improvement a short distance below the Arkansas line, reports that at Mayersville chute there has been a surprising change within the past year. He says: "A pile five feet longer than the rest, marked to indicate the front of the dike at high water, still remains standing upright and firm, but it has traveled 62 feet down stream erect and firmly embedded in the sand. Such cases have been reported heretofore, but not credited by me. This case I observed myself. It can only be accounted for on the supposition of a bodily movement of the sand foundation."

The many and great changes known to have taken place in the channel of the Mississippi within a comparatively recent period may, in connection with such records from authentic surveys, give us better means of carrying out the further improvements contemplated in the river channel, or, at least, give a clearer apprehension of the difficulties in the way. "It would seem," says Major Harold, one of the officers of the Commission, "as if all the material in the trough or bed of the river was in motion like an Alpine glacier, which, although a solid river of ice winding through the rocky ravines of the mountains, has an actual progressive motion. We may suppose the mud and sand which make up the deposit is undergoing bodily translation, like a glacier. In no other way, as it appears, can this pile, maintaining its solid hold in the mud and sand and its perpendicular position, be accounted for."

Mortality among Fishes.

A correspondent says the quotation from "Mr. Charles Hallock, a fisherman of repute" in relation to this subject in the SCIENTIFIC AMERICAN of February 23, 1884, appears to convey the idea that air is absolutely necessary to fish to enable them to live. He cites pickerel as "more subject to mortality from this cause (absence of air) than others." It is to be demonstrated that pickerel require more atmospheric air than hibernating fish—or rather, that they require air in winter any more than other fresh water fish. Their voracity impels them to seek food at all times, and the attraction of a live bait through the fisherman's hole in the ice probably has more to do with the pickerel's approach to this hole than has his desire for air.

When I was a boy I carried home a block of ice cut from the lily pads in an adjacent pond in which was frozen a half grown pickerel. The ice was put in my mother's wash tub in the kitchen and gradually thawed. When it thawed the pickerel was as lively as he ever was, and was apparently waiting for breakfast.

I bought three frozen pickerel at a market a few years ago. Either one would probably have broken in two, like a glass fish, by pressure or a blow. Placed in cold water that night, in the morning one of them was as frisky as though just out of his sunny or shady resort. Evidently in each of these instances the fish did not languish for atmospheric air.

Phylloxera in Portugal.

Accounts from the Oporto wine growing districts state that the phylloxera is causing such devastation there as to threaten the very existance of the vineyard.

The Trade Schools of New York.

A reporter of the *Evening Post* lately paid a visit to the New York Trade Schools, an institution of which comparatively nothing is known, considering the importance of the work accomplished and its interest to every intelligent person in the community. Walking down Sixty-eighth Street from Third Avenue toward the East River, one sees, blocks away, the bright lights from a row of neat one-story buildings, which, after dark, give a cheerful appearance to a rather desolate neighborhood. These are the shops of the Trade Schools. The whole frontage on the east side of First Avenue between Sixty-seventh and Sixty-eighth Streets is occupied by the shops, unpretentious but well built one-story structures, with large windows on every side, from which at night the brilliant light within streams forth. From the street the buzz of many men at work can be heard. These trades schools of New York, not yet four years old, are the first serious and successful attempt to remedy an evil due directly to the selfish and mistaken policy of the trades-unions of this city. In order to limit the production of good mechanics, the trades-unions, almost without exception, have made rules prohibiting employers from having more than a certain number of apprentices irrespective of the number of workmen they may employ. Thus a "boss" carpenter or builder may not have more than two apprentices at a time, whether he employs one man in his shops or one hundred. A plasterer may have two, a stone cutter may have three, a bricklayer may have two, and so on through the whole list. In some trades boys are a necessity, as in plumbers' shops, each man requiring a helper, who in course of time becomes a full fledged workman. The tailors put no limit to the number of apprentices an employer may have, but very few American boys want to learn that trade. In consequence of these arbitrary rules, thousands of New York boys grow up without the knowledge of a trade, and the places which they ought to take are filled by foreign workmen. The number of apprentices allowed to the bosses by the unions, even if all apprentices become good workmen, would be wholly insufficient to supply the demand for good mechanics. Protests against these rules have been found useless, and violations of them have been followed by strikes, To mention but one instance in illustration, John J. Tucker, one of New York's oldest and best builders, employing more than one hundred men, dared, two years ago, to take into his employ a third apprentice. The boy was a bright young fellow, and pleaded so hard for a place in the shop that Mr. Tucker took him in. The next day one of the walking inspectors of the union informed him that the boy must be discharged, as there were already two apprentices in his shops. Protests proved unavailing, and rather than submit, Mr. Tucker allowed his union men to take their tools and go. Since that time he has gone on in defiance of the union. Where one employer has determination enough to break with the unions, scores are either unwilling or unable to do so. Contracts are frequently made by which the contractor is subject to penalties in case of delay; strikes are therefore so costly and dangerous that almost any rule of the union, no matter how unjust, will be obeyed. The result has led to idleness among young men, scarcity of good workmen, and the necessity of importing foreigners who already know their business.

The trade schools were founded to supply what the unions refused. To do passably good work as a bricklayer, or a plasterer, or plumber requires usually an apprenticeship of several years. Much of the time, however, is taken up in labor which pays the employer, but teaches the boy nothing. He is not allowed to handle the tools of the trade, or do any actual work except at odd moments: if he is bright, and watches the workers carefully, he may become a journeyman in two or three years, but the dull boy has no opportunity whatever, and the hod carrier remains a hod carrier as a rule and does not become a mason, simply because he lacks ambition to pick up the knack of handling a trowel in spite of the opposition of the masons to whom he brings bricks and mortar. The same rule applies, in a modified aspect, in all other trades. A systematic attempt is made to keep boys from learning to become competent workmen.

It occurred four years ago to a New Yorker who had the good of the community at heart, and abundant wealth to carry out a far-reaching scheme, that bright boys and young men could, under competent instructors, obtain the knowledge and knack of trades which the unions denied them or which they had no opportunity of obtaining, by devoting a few hours every week to the actual practice of the trade they wished to learn. A few hours a week may be more actual instruction than a young apprentice can get in the shop where he is employed. The expectation is not, and never was, to turn out first class mechanics as the result of three evenings' work a week for five months of the winter; but in that time a young man who is industrious can learn enough of whatever trade he chooses to handle the tools intelligently and to do work which will compare favorably with that of other young journeymen. He will do good enough work to get at least living wages, and thus obtain a chance to perfect himself in the trade by daily practice.

The first building entered by the reporter was the bricklayers' school, a long, brightly lighted shop in which more than twenty young fellows were at work, each building his particular piece of wall or arch for that evening. Each had his own tools, his mortar board, and his pile of bricks. A first class mason employed by the school went from one worker to another, giving a direction here, a hint there, or showing how the work ought to be done. The men, most of them about twenty years of age, worked quickly and handled their tools with a thoroughly workmanlike knack, tossing the bricks, knocking off pieces to make them fit, laying the mortar and pointing the points with neatness and without the slightest awkwardness which might be expected in beginners, the truth being that these young fellows in their few months of practice three evenings a week had had more actual bricklayer's work to do than a regular apprentice at the trade gets in a year. These lads were as fine a lot of young workmen as could be wished for—bright, quick, and eager to make the most of their time; and the same may be said of the men in all the shops of the schools—167 in number this night. In the bricklaying shop the men work on Monday, Wednesday, and Friday evenings, from 7 to 9:30 o'clock, beginning on November 4 and ending on April 4. The instruction given covers all the ordinary work of a competent bricklayer—building piers, arches, flues, fire-places, setting sills, lintels, etc. The terms are $3 a month or $12 a year, and the pupil must not be younger than seventeen years or more than twenty-five. Exceptions as to age are made, however, in particular cases. Every one of the young men at work on Wednesday night had his living to make during the day, and came there at night to pay money for the privilege of learning a trade.

The plastering shop was next visited. A word should be said as to the admirable lighting of the shops. Gas is used unstintingly, and every shop is as bright and cheerful a place as can be imagined. The plastering shop was begun last autumn at the request of some of the men who had learned bricklaying in the schools, and having secured daily work as bricklayers, were eager to learn plastering in order to have employment in winter. Fourteen men were at work in this shop hard finishing the walls of small rooms built on purpose. Each man had his own room to finish complete, from the scratch coat to the hard finishing and running the cornices. The men pay $5 a month.

In the stone cutting shop, half a dozen young men, who paid $3 a month for the privilege, were hammering away at brown stone, and a creditable piece of stone frieze with elaborate carving and mouldings was nearly done at one side of the room. In the pattern making room the parts of a steam engine were under way, the men working from drawings set before them. Adjoining this is the carving shop, where the work is pretty enough to attract any one, and in fact one of the workers was a clerk who was learning the art as a recreation for the evening after a day's work over his ledgers. A comment as to the neatness and beauty of the carving tools called forth the remark from the gentleman to whose energy and thoughtfulness the whole enterprise is due, that in the three years of the schools' existence, there has not been a bit of wanton injury done to the building or its tools—not even a pencil mark on the walls—and no profane language ever heard. Next to the carving room is the fresco-painting department, where a dozen young men were found at work upon designs for ceilings, from the straight lines of the beginner to the most elaborate color designs. The instructor is a painter recommended by the Messrs. Marcotte, and has done excellent work.

The plumbing shop was the last one visited, and proved to be one of the most interesting. More than thirty young fellows were at work at what is technically known as "wiping joints," that is, joining two pipes with melted lead. The instruction in the plumbing shop is practical on two evenings of the week, and scientific on the third. The practical instruction includes dressing pipe, making lead joints, wipe joints, sand bends, lead safes, fitting up baths, basins, boilers, sinks, wash tubs, water closets, etc. The scientific instruction is upon the proper arrangement of service and water pipes, and upon drainage and ventilation. Many of the pupils of this class are helpers during the day in city shops, and thus get a chance in the evening of doing the work themselves which they see others do during the day. Each man has practical work to do: he has his plumber's furnace and lead pot in front of him, the heat being furnished by Bunsen gas-burners. Upon the charts and blackboards are cuts showing the arrangement of different systems of pipes for boilers, water-closets, ventilation of traps, etc.

A boiler and sink fitted up with elaborate arrangements for hot and cold water, all done by the young men of the schools, took a prize for workmanship at the last American Institute Fair, and it ought to have been mentioned that the building occupied by the bricklayers was put up by the pupils last autumn, and is an excellent specimen of brick-work.

In the pleasant office of the schools some details as to the history and working of the institution were learned. The trade schools were opened in 1881 with an attendance of thirty-three. In 1882 the season began with eighty, and this year with 207. About one-third each year find the night work too hard, or that the occupation they fancied is uncongenial, and drop off. Three of the classes this winter, the bricklaying, plumbing, and plastering, are full, and bonuses have been offered of $15 and $20 for the privilege of joining. This spring additions will be made to the buildings, which will give room for 350 young men in the different workshops. The schools were not intended to serve the masters or to oppose the unions; they simply give young men a chance to make a fair start in the world. Union men have brought their sons to the schools and paid their fees. Although some manifestations of hostility were shown at first, there have been signs of a friendly feeling from the unions this winter, and some of the teachers are union men. In reality, these and similar schools would bring up mechanics and relieve journeymen from the competition of cheap unskilled labor. It would seem better to teach young men at home how to work than to send to Europe for skilled labor.

As an example, last spring seventeen young bricklayers, between eighteen and twenty-five years of age (their portraits hang in the office of the schools, and they are as creditable looking a lot of young men as any city could turn out), left the schools. Fourteen have been heard from, one of whom died. Of the thirteen, eight found work in different country towns at wages varying from $1.25 to $2 per day, and four got work from a non-union builder in New York. All of these young men received wages varying from $3 to $4 per day in the autumn. One went directly to Chicago, where he knew no one and had never been before. He asked the foreman on a building if he wanted a bricklayer, and was set to work at $4.50 per day. He joined the union, and received those wages until winter. He has now begun business in Chicago as a contractor on the money he saved. This, of course, is an exceptional case. Still, what one can do others can do.

The 167 young men now at the schools come from all parts of this city. Quite a large delegation comes from Brooklyn, four come from Hoboken, one from Orange, N. J., one from Bergen Point, and one from Stapleton. They work at their different callings all day, and use their evenings in learning how to improve their condition in life. Giving up the evening to work after a busy day's labor, and paying from their wages for the privilege, and getting home late at night (for those who live beyond the city limits have from an hour to an hour and a half of travel, with its expense, before them). This means an amount of self-sacrifice and perseverance which promises well for their future.

The tuition fees received during the year about pay for the instructors' services and for the material used. The other expenses are met by the founder of the schools.

How to Tell Pure Loaf Sugar.

A correspondent asks the New York *Sun* the difference between the sugar which is sold in apparently smoothly cut lumps and other white sugar, the lumps of which are somewhat rough on their surfaces. "The difference is considerable, and the latter, which is pure loaf sugar cut into lumps, always commands a higher price in the wholesale market, and cannot be adulterated. It is called in the market 'cut loaf.' The former quality of sugar is what is known as 'cubes.' The cut loaf sugar is made in lumps of fifty pounds out of cane sugar, then sawed into slabs, and these slabs are partly cut through and partly broken. It is easy to distinguish the marks of cutting and breaking on each lump.

"The cube sugar is made of soft sugar and pressed in moulds, which gives the smooth appearance. The cut loaf sugar will keep its shape in any climate, and is suitable for shipment. The cube sugar will sometimes on a sea voyage resume the consistency of the soft sugar, and the change of form is due to adulteration.

"The safest sugar for any one to buy is pure loaf sugar, and it is much sweeter than any other. The principal substance used in adulterating sugar is glucose, which is sugar made from various vegetable substances, chiefly grain. While glucose is sweet, it is easily detected by the expert because it is not so sweet as cane sugar. It is, nevertheless, very extensively used to adulterate cane sugar and produce the cheap sugars which are sold in the market. Reputable dealers sell it as glucose, but there many dealers who sell glucose for sugar. The nature of the glucose is to make a close, sticky sugar; it does not produce grains, like cane.

"The polariscope readily exposes any adulteration of sugar, but there is need of some ready household test, by which housekeepers, who cannot afford a polariscope, can tell whether they are buying cane sugar or glucose. The glucose is not harmful as food, but its sweetening properties are limited. The official test of cut loaf sugar is 100 per cent. Other refined sugars in lumps do not always reach that test. At present the precise form of the genuine cut loaf sugar has not been counterfeited."

Invisible Wire.

Platinum wire has been drawn down so fine by Mr. H. F. Read, of Brooklyn, as to be invisible to the naked eye, although its presence upon a perfectly white card could be detected by the touch and could be seen with the aid a small magnifying glass when the card was h ld in such a position that the wire cast a shadow.

A small platinum wire, about No. 18, was inclosed in a close fitting tube of silver. The tube was made by taking a long and narrow sheet of silver, about one-twentieth of an inch thick, folding it over into a cylinder, and drawing down until the wire would just fit in it. This was then drawn down until the tube containing the wire was only as large as the original wire. A short length of this was cut off and incased in a second tube of silver, which was drawn down in the same way. This operation was repeated until the platinum wire had been reduced sufficiently in diameter. The last wire was drawn as fine as the dies would permit, when the silver coating was removed by an acid. During the work it was necessary occasionally to anneal the wire.

The resulting wire was in short lengths and had no strength. It was designed to be used for the cross wires in telescopes, its perfect opaqueness and fineness rendering it particularly applicable, but its extreme weakness made its handling almost an impossibility.

ENGINEERING INVENTIONS.

A grip for electric cars has been patented by Mr. John C. Henderson, of New York city. In an electric motor drive-car, with a hole in its bottom, is carried a vertical rod with rollers at the lower end, to act as an adjustable clamp on a rail or bar arranged in an underground longitudinally-slotted tube.

A car coupling has been patented by Mr. Edward F. Pendexter, of Milford, Mass. The invention covers a lever held at its inner end on a draw head, and having two prongs, one of which, at the outer end, has a lug on the bottom surface, so the lugs of two opposite prongs engage with each other, and thereby couple the cars. The outer ends of the levers pass through frames projecting from the ends of the cars, keeping the levers in proper position, and guiding them while uncoupling the cars.

MECHANICAL INVENTIONS.

An improved vise has been patented by Mr. Henry A. Hyle, of Redwood, N. Y. The jaws are recessed, and in the recesses are cylinders, adapted to be turned in the jaws, these cylinders having recesses or cavities of various shapes, both longitudinal and transverse, for holding objects in horizontal and vertical positions, these cylinders being set according to the shape of the object to be held.

A saw-mill dog has been patented by Mr. William H. Snyder, of Waynesborough, Penn. It is arranged in a sliding head, adjusted by a pinion or toothed segment over a vertical rack bar, affixed to the side of the knee of the log of the carriage, and with a sliding head, pinion, and rack bar is a lever with a loose play about the axis of the pinion, with peculiar bearings, etc.

An improved reamer has been patented by Mr. Charles H. Malmedie, of New Bedford, Mass. The invention combines in one device a reamer of fixed diameter, an expanding or adjustable reamer, and a gauge of standard size for determining the diameter of the reamed hole, so great accuracy is obtained, the durability of the tool is increased, and work is done with greater facility.

A felly-boring and spoke-tenoning machine has been patented by Mr Edwin M. Jenkins, of Browning, Mo. A rotary hollow mandrel, adapted to carry a tenoning head, is combined with a hollow cutter and boring socket, with a shaft arranged to slide in the socket and mandrel, and be screw-clamped thereto, having a key seat along its whole length, and provided with a stop, there being also a chuck and felly clamp, and table arranged to shift up and down to determine the relation of the chuck and clamp to the tool socket.

AGRICULTURAL INVENTIONS.

A corn planter has been patented by Messrs. William Hopper and Isaiah J. Allen, of Jefferson, Iowa. This is an improved mechanism for operating the dropping apparatus, markers or pointers, denters, and driving guides, designed to provide more simple and efficient machines than such as are now in use.

A grain drill has been patented by Messrs. Moses F. and Thomas A. Foley, of Waveland, Ind. This invention is to adapt grain drills for use in drilling wheat between rows of corn, and the plow beams are made with holes to receive the lower ends of the seed-conducting tubes, the tubes, standards, and beams being conveniently connected.

A plow attachment forms the subject of a patent granted to Mr. John O. Caldwell, of Goshen, Ga. It is in the nature of a detachable mould board for the turning shovels of a light plow, to prevent the collection of earth, vines, weeds, etc., on their upper portions, the attachment being fixed by two bolts, so as to be quickly applied or removed.

A cotton scraper and cultivator has been patented by Mr. Seth H. Fountain, of Amite City, La. In a cultivator are two front scrapers, beveled and with an open space between them, and two shovels in the rear of each scraper, the scrapers being vertically adjustable and the plows laterally adjustable, and the whole being suitably jointed together, to promote the vigorous growth of small plants.

MISCELLANEOUS INVENTIONS.

A rein guard has been patented by Mr. Charles W. Speaks, of Canal Winchester, Ohio. It is a device for holding the reins raised, so the horse cannot throw its tail over them, and consists of a wire frame bent and twisted to form standards, with rein rest and braces.

A chain for draperies has been patented by Mr. Christian A. Schmidt, of Hoboken, N. J. The invention consists of a chain on which tufts or balls of fibrous materials are fixed at suitable intervals, the tufts being held on or between the links as may be desired.

A pistol game apparatus has been patented by Mr. John R. Mestier, of Corpus Christi, Texas. In combination with a horizontal revolving table, with stalls for a ball, is a pistol device for dropping the ball into the table while revolving, for playing a game, in which the score is to be counted by the number of the stall into which the ball falls.

A book holder and rest has been patented by Mr. Edwin V. Parker, of Strafford, Vt. Two strips of wood or metal are united at one end by a bowspring, and at their other ends have cross strips, in connection with a U-shaped standard and a spring clip, whereby a book may be held open and its inclination varied as desired.

A wire fence fastener has been patented by Mr. Charles E. Griffith, of Storm Lake, Iowa. The invention consists of a screw with spirally curved eye, which will hold a fence wire away from a tree, but leave a free longitudinal play of the wire through the eye, thus making a simple, cheap, strong, and easily adjustable fastening.

A folding kite has been patented by Mr. Joseph Stumpp, of Brooklyn, N. Y. The kite is made with the inclined bars of the frame in two parts, connected at their adjacent ends by sliding tubes, so the parts can be readily separated and the kite rolled into a compact bundle, to promote convenience in storage and transportation.

An improvement in the manufacture of material for electric insulation has been patented by Mr. William V. Wilson, of Jubilee Street, Mile End, Middlesex, Eng. The invention covers the consolidation of wood or vegetable tar by the use of nitro-cellulose, softened in a special manner, and the mode of its application for insulating electric conducting wires.

An improvement in barbed fences has been patented by Mr. Willis K. Gore, of Johnstown, Penn. According to this invention, the top and bottom rail are formed of two wires twisted together, in combination with intermediate vertical plates, with two barbs at each end, bent and passing in opposite directions through the twisted wire.

An apparatus for loosening up and removing sandbars, etc., in rivers and harbors has been patented by Messrs. Larence A. Johnson and N. E. Johnsen, of Portland, Ore. It is a machine with rotary cutting wheels and plows, to be drawn over a river or harbor bottom behind a steamboat or barge, to break the covering or crust that sometimes forms on sandbars.

A pocket knife has been patented by Mr. Orison Huff, of Lyman, Me. Its peculiar construction adapts it to be opened or closed with one hand, the knife handle being formed of two hollow sections, the upper one with a collar, pin, and projections, and there being a spring pressed and notched locking plate, so that the knife can be opened with thumb pressure and a slight jerk.

An improved boiler has been patented by Mr. Alfred E. Dalley, of Quincy, Mich. This is an improvement of the combined furnace and boiler used by farmers for cooking food for cattle, boiling sirup, etc., and consists in so arranging the flue through which the heat products from the furnace pass that the heat will act more effectually on the bottom than is the case with the present style of furnace and boiler.

An improved letter box has been patented by Mr. Charles F. Maize, of Philadelphia, Penn. This invention covers a special construction of parts of the box, arrangement of guard plates for the newspaper drop, novel self-closing lid for the letter drop, with improved hood, in which the letter drop lid is fitted, to exclude water from the box, all to afford increased security and protection to mail matter deposited in the box.

An insulator for electric wires has been patented by Mr. William W. Beach, of New York city. The invention consists of an insulating block with grooves to receive the wires, and a tongued piece for holding the wires in the grooves, and a frame adapted to surround the block, and provided with a series of tongues for partly filling the grooves, so that a series of wires can be held.

A corn sheller has been patented by Mr. Luther Matthews, of Paris, Texas. The invention comprises a double shelling surface of peculiar construction in one plate or bed piece, so a corn sheller with but little weight is produced capable of shelling either one ear, or, by using both hands, two ears at the same time, doing its work easily, and with ready clearance for the shelled corn.

A process for the manufacture of cream tartar forms the subject of a patent issued to Mr. Franz Dietrich, of Munich, Germany. It consists in treating the dissolved argols with phosphoric acid, or its compounds, and then clarifying and discoloring, the mixture being boiled, the clarifying effected with clay, and finally decolorized with animal charcoal, previously treated with muriatic acid.

An improved lock has been patented by Messrs. Rudolf E. Woodrich, of New York, and Charles Langbien, of Brooklyn, N. Y. This lock is made with an extensible casing and bolt, the bolt resting on independent pivoted cam plates, adjusted to be turned by a key inserted through escutcheons screwed into screw-threaded apertures in the casing, thereby holding the casing in place in the drawer or door.

An improvement in hanging doors has been patented by Mr. Alexander H. P. Leuf, of Brooklyn, N. Y. Crossbars are pivoted in recesses in the ends of the door, and have pivots hinged to their ends to engage with sockets let into the door casing, so the door can be opened in either direction and from either end. The pivots, while serving as hinges, are locked in place by spring pressed bolts, which enter grooves in the pivots.

An improved motion transmitter has been patented by Mr. Henry Gardner, of Bordentown, N. J. It is designed for sewing or other small machines that are frequently started and stopped, and is controlled by the foot of the operator. The invention covers a special form of hanger with square socket and square ended shaft, which may be easily changed for different speeds, and the whole is simple, quick acting, and trustworthy.

An extensible fire escape has been patented by Mr. Paul Kingston, of Hastings, Minn. This fire escape combines a series of lazy tongs, in pairs connected by cross rods, and connecting links with stops, and braces to engage with the stops, so the device may be rendered rigid and firm, and, with guide ropes, may be adjusted and held by a windlass for use at any desired elevation, and may be folded compactly when not in use.

An improved floor scrubber has been patented by Messrs. Peter O. King and Andrew M. Carlson, of Valley City, Dakota Ter. The invention covers a special construction of clamp or holder, with hinged attachment of the clamping side pieces to each other to operate with clamping screws passing through the side pieces, etc., so a substantial and cheap scrubber can be made, and one with increased facility for inserting or removing the rubber or other scrubbing material.

An improvement in pipe and other joints has been patented by Mr. James A. Baldwin, Jr., of East Jaffrey, N. H. It is more particularly for flange joints, and consists in a copper ring, having in its projecting face an annular groove, so made that when the two flanges or pipes are drawn toward each other in tightening up the joint the partially countersunk copper ring will form a close fitting packing between the flanges, so it will resist great pressure, and make the joint equal or superior to a ground one.

An improvement in the manufacture of mosaic and other tiles has been patented by Mr. Jean Larmanjat, of Paris, France. The invention covers a process of brightening the colors of tiles and a mode of moulding them. The bright-ning is effected by treating the powdered material or cement with soft soap, and the moulding of inlaid designs for ornamental tiles is done in a compound mould, with which the whole of the design may be deposited at one time upon the material forming the base of the tile.

A car door lock has been patented by Mr. James Sharkey, of Honey Creek, Ind. A latch bar is pivoted to the car body below the lower back corner of the door and reaching up at an angle of about 45 degrees to about midway between the vertical edges of the door, where it is connected to form a latch for fastening the door without being locked, and a slide bolt and lock are contrived with the latch bar to lock the door, making a very simple and substantial locking device.

A device for destroying insects has been patented by Mr. Charles J. Gustaveson, of Salt Lake City, Utah Ter. This invention covers an apparatus with a spirit lamp beneath a vessel for raising steam, the latter having a flexible pipe to direct the jet as desired, and, for an insect destroyer, poisonous materials are volatilized, while the apparatus may also be used for disinfecting or fumigating a sick room, by using carbolic acid, or other suitable substance, evaporated with the water, the apparatus having special improvements.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

NEW BOOKS AND PUBLICATIONS.

THE MEDICAL DIRECTORY OF PHILADELPHIA FOR 1884. Edited by Samuel B. Hoppin, M.D. F. Blakiston, Son & Co., Philadelphia. Price, $1.50.

This is an alphabetical and street list of physicians and directory of dentists, druggists, medical societies, homes, and charitable institutions.

THE PRONUNCIATION OF GERMAN. A PROGRESSIVE STUDY OF THE SOUNDS OF THE GERMAN LANGUAGE, WITH DIRECTIONS FOR PRODUCING THEM ACCURATELY. By Charles F. Kroeh, A.M., Hoboken, N. J. Published by the author.

The title of this little work is a good *resume* of its contents. It constitutes No. 1 of a series of drill books by the same author, which are in preparation, and which will treat of the German and French verb. The book is an excellent one for the purpose, being modeled on the "rational method," for which Professor Kroeh is well known.

The Railways and Tramways of New South Wales, according to the report of the Commissioner from Sydney, Sept. 1, 1883, had cost, up to the close of 1882, £16,776,642, and £11,000,000 more had been authorized to be raised for the completion of work in progress. The average interest paid for railway loans has been 4·26 per cent. There are 1,321¼ miles opened for traffic, of which 88 miles have double track, and 889 miles of road laid out are to be finished. The report treats very thoroughly of the details of the business done and the condition and equipment of the roads.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) J. M. H. asks how saltpeter acts when used with salt and sugar to preserve meat. What is the effect? A. The action of saltpeter would be that of an antiseptic, that is, it would tend to prevent fermentation or putrefaction. Borax or boracic acid is more commonly used as a preservative for meat. The use of sugar in this connection we think would hardly be desirable or even necessary.

(2) W. S. N.—Pearline is simply a trade name given by James Pyle to a soap manufactured by him. We do not know its composition, and cannot tell unless a chemical analysis of it were made, but from its title we think very likely that it contains pearlash,

or potassium carbonate. Bluing may be made by treating 1 ounce pure Prussian blue with 2 ounces concentrated hydrochloric acid. Effervescence ensues, and the mixture soon assumes the consistence of a thin paste. This can then be moulded in balls or dried and powdered, or else left for 24 hours, and then dilute with 8 or 9 ounces water and bottle it.

(3) E. L. N.—The paste sent consists of rouge (red chalk) mixed with some oil or tallow, probably boiled linseed oil. Powdered tripoli is likewise used in combination with boiled linseed oil as a paste for polishing. The difference in quality found in various samples is probably due to the different degree of fineness to which the rouge or tripoli is ground. As it is more finely ground, so does it increase in efficiency. Liquid oxygen is not suitable for the production of the oxyhydrogen light.

(4) A. W. G. asks how the polishing paste for cleaning and restoring tarnished nickel is made? A. Use chalk or rouge mixed with tallow.

(5) S. S. asks: How many "Bunsen" cells of 1 gallon capacity will it require to produce an arc light of one-eighth inch carbon candle, length of conducting wires 20 feet? A. Fifteen to twenty.

(6) J. C. W. asks: What substance can be used as a conductor of electricity, and yet have but little or no spring? A. Comminuted metals, acidulated water, powdered carbon, lead, soft copper, soft iron, mercury.

(7) J. H. D. asks: Is there any substance which can be mixed with ground talc, so as to form a paste which will harden in moulds, and yet be fireproof? A. It can be mixed with hydraulic cement or plaster of Paris, both of which would crack when exposed to heat. Perhaps it would be more desirable to incorporate the talc with kaolin or some clay, satisfactory to you, and bake the product. There would result a sort of earthenware.

(8) G. S. B. asks: 1. Can magnetic force be transformed into electric force (the force of permanent steel magnets, I mean)? If so, how? A. Yes, by revolving an electro magnet before or between the poles of the permanent magnet, and taking the current from the terminals of the electro magnet by means of a suitable commutator, as in the magneto-electric machine. The telephone magneto call and the magneto-electric medical machines are examples of machines producing an electric current from permanent magnets. 2. Having read in SCIENTIFIC AMERICAN Reference Book that ice boats on the Hudson River travel faster than the wind, I would like to have the philosophy of it explained. A. See SUPPLEMENT, No. 214.

(9) W. A. asks: 1. What is the thickness of the carbon used in the Blake transmitter, and how is it made? I have an electric light carbon seven-sixteenths inch diameter, coppered; will it answer to make buttons for transmitter? A. Your carbon is about the right diameter. The thickness of the button is immaterial, from one-eighth to one-quarter inch thick will do. The face of the button must be well polished to secure good results. The hard French carbons are best for the purpose. 2. I have several ounces of silk insulated copper wire (I inclosed sample). I think that it is No. 30; will it answer to wind the spools of telephone described in SUPPLEMENT No. 142, or had I better use a smaller size? A. Your sample of wire is No. 30 Am. W. G. It will answer a purpose, but is not so good as No. 36. 3. Should the end of a steel bar in telephone upon which the coil is placed be tempered and hardened, or should the whole of the bar be hardened and tempered? A. They will work well either way. Perhaps merely hardening the ends is quite as good a plan as any.

(10) B. V. F. asks: Will two Leclanche batteries of good size heat fine wire so as to be practicable for lighting gas? If not, how many batteries should be used, and what kind and size of wire should be used in either case? A. No. One small cell of plunging bichromate battery will do it. Use half-inch of No. 36 platinum wire. By employing a helix with a magnetic core, your two Leclanche cells may be used to produce a spark that will light gas. See any work on physics for the manner of producing the extra current and spark.

(11) S. J. B. asks what he can use to preserve paste or starch for mounting photographs? A. Carbolic acid, salicylic acid, and oil of cloves are all used for this purpose. The amount to be used must be very small, probably not over one per cent; frequently a much smaller quantity is used.

(12) S. T. asks how to make solution for cast iron, so it would have coppered surface? A. Make a solution of 2 oz. copper sulphate in 1 qt. water, add 1 oz. of sulphuric acid. Clean the iron by pickling it in dilute sulphuric acid, and washing and scrubbing it with a wire brush before immersing it in the coppering solution. After removing it from the solution, wash thoroughly with water.

(13) C. O. R. asks: 1. Is there any diamagnetic substance known that is quite or nearly perfect? A. Bismuth is the most diamagnetic substance known. 2. Is there any known substance that would allow a permanent bar magnet to act only in one direction, and not permanently neutralize or prevent its action in opposite direction? A. No. 3. What will efficiently neutralize "damp," or carbonic acid in wells? Sometimes in digging wells it nearly overcomes me. I have used lime and lime water, but with unsatisfactory results. A. Ventilation is the only efficient remedy. Drive out the foul gases by forcing in fresh air.

(14) G. H. asks: 1. How may eggs long preserved by cold storage or other methods be detected? Can they be told without breaking? A. Expert dealers have a way of looking through them at a light, and judge by the shade if they are sound, but it is very doubtful if any one can tell how long they have been stored.

(15) J. D. writes: For finding the nominal horse power of a compound engine we have the rule:

$$\frac{d^2 + D^2}{30} \text{ or } \frac{d^2 + D^2}{32}.$$

According to some makers, the divisor is 30 circular inches, with others 32. However, what I wish to know is, wishing to reckon the diameters of the high and low pressure cylinders from the nominal horse power, I would like to know whether there is, or which rule is generally used by builders. Say I have to give the exact diameters for an engine of 140 N.H.P. Which rule can I use? A. Of the two formulas submitted, we should prefer that which has 30 for denominator. For the nominal H.P., Seaton gives the following:

$$\text{N.H.P.} = \frac{d^2 + D^2}{n}, \text{ where}$$

d = dia. of H.P. cylinder.
D = " " L.P. "
n = circular inches, which may be 30 to 32 or 33, the lower denominator for the higher pressure, say of 90 or 100 lb.; and for the diameter of the H.P. cylinder:

$$\sqrt{\frac{\text{N.H.P.} \times n}{1 + r}},$$

where r is the ratio of capacity of the low to the high pressure cylinder, and the diameter of the low pressure cylinder $= d\sqrt{r}$. Example for an engine of 200 N.H.P., the ratio of low pressure to high pressure cylinders being 4 and $n = 33$, then

$$\text{dia. of H.P. cylinder} = \sqrt{\frac{200 \times 33}{1 + 4}} = 36{\cdot}3 \text{ inches.}$$

And dia. of L.P. cylinder $= 36{\cdot}3 \times \sqrt{4} = 72{\cdot}6$ inches.

2. What relation do the diameters bear to each other, or do the dimensions of high and low pressure cylinders depend upon their areas? A. For steam pressures of, say 80 to 100 lb., the contents (or area of piston of the stroke of both pistons is the same) of the low pressure cylinder is usually 4 times the H.P. cylinder, and for pressures 60 to 80 lb. the ratio is 3·5 to 1.

(16) J. F. B. asks how to make a small incandescent electric lamp, or tell me the number of a SUPPLEMENT describing one, if there is one? I should like to know the material the lights burn on, and the size of it? A. It would be difficult for a novice to make a modern incandescent lamp. He would require a glass blower, or would have to learn the art of glass blowing. He would want carbonizing apparatus and the most perfect air pump, and added to all this, a long experience. Full descriptions of the manufacture of these lamps can be found in the back numbers of the SCIENTIFIC AMERICAN and SUPPLEMENT. An experimental incandescent lamp may be made from a coil No. 36 platinum wire, but it would not answer for continued use.

(17) W. S.—1. The painting and bronzing of radiators retards their heating qualities. 2. The horizontal pipes along the sides of the room are more efficient than when placed vertically, as in radiators, with the same amount of surface in both.

(18) J. D. P.—Ordinary moulding sand is used for zinc castings just as for iron. For heat the zinc should be melted until the vapor from the metal is visible.

(19) S. P. C. asks for a receipt for making a carbolic dip into which stock may be plunged for killing lice and mites? A. Use soft soap, 1 gallon; heat with 30 gallons of water up to a temperature of 140°, then add one quart of crude carbolic acid. Then cool down to 110° and dip the sheep or lambs; but for other animals, pour it along the back so that it runs down the sides. Great care must be taken that it is applied to the brisket, under the shoulders and thighs. For the sheep scab mites the temperature should be 120°, and the scabs should be completely broken up by a corn cob.

(20) H. E. H. asks: 1. Will two cylinders of same stroke, with different diameters and same sized ports, exert the same power? A. No. 2. Will two cylinders of same size exert the same power, if one has but one piston, and the other has two, traveling opposite directions, both having the same sized ports? A. No. 3. What is the average pressure of steam in passenger locomotives while running? A. One hundred and twenty to 140 pounds. 4. What distance could a locomotive pull a train, if its boiler was charged with steam to its average pressure, and the fire was drawn out, before starting, the atmosphere being about 70°? A. This cannot be answered except upon specific conditions—as to capacity of boiler, weight of train and locomotive, grade, condition of track, etc.

(21) A. B. N. asks how papier mache is made? A. Papier mache is made by pasting or gluing sheets of straw or other thick paper together when wet and pressing to the shape of the mould, or making a pulp of the paper material and pressing the pulp into the moulds.

(22) G. W. E. asks if there are any steam or electrical buggies in use? A. There have been several electrical and steam buggies and tricycles invented (mostly in Europe), but they are for the most part not in practical use.

(23) T. J. T. asks: 1. How long will cottonwood Linn. (basswood) and red elm last in fence pickets? A. Basswood when well preserved and painted is very durable, and might last for pickets as long or longer than pine—perhaps twenty years. Cottonwood is almost as durable when painted and preserved from the weather. Red elm is not durable for this use. 2. What is the best and cheapest preservative for that kind of wood when exposed to the open air? A. Common paint, linseed oil, and the brownish red oxide of iron make one of best outdoor paints. 3. What is their value compared with yellow or white pine? A. Southern yellow pine would perhaps be better than basswood or cottonwood, but white pine would be no better for outdoor use.

(24) F. J. del C. asks how to make the so-called parchment paper. What strength of acid to use, and where to obtain or how to make it of the requisite strength? A. To make parchment paper dip ordinary unsized paper for 5 or 6 seconds into dilute sulphuric acid, and wash with weak ammonia water, acid 1 part, water 4 parts.

(25) J. K. asks: 1. What is the greatest speed that could be attained by a steamboat, a screw propeller, in smooth water, of the following dimensions, and what description of boiler or boilers and engines would be the most suitable, and the amount of power required: Length over all, 75 feet; breadth of beam, 14 feet; depth of hold, 6 feet; draught of water, not more than 4 feet? A. We think about 16 miles per hour, if of good model and very light. A plain, simple engine, 12 to 14 inch cylinder, and 12 inch stroke, with locomotive form of boiler of ample capacity to carry 120 to 140 pounds of steam, having not less than 600 feet heating surface.

(26) I. H. F. sends us a japanned buckle. A. The sample is dipped. String upon very small wires. Thin the japan with turpentine. Heat the work to above 200° F., then dip, and hang in oven. Turn the pieces over upon the wire 2 or 3 times while they are disposed to drip. This will make the japan even. If the japan is good, it will stand considerable thinning before it loses its gloss.

(27) L. H. D. writes: I am using water taken from a tank lined with ordinary sheet zinc, for greenhouse purposes. I notice, after the foliage of the plants has been regularly sprayed for a month or so, the leaves become spotted with a whitish stain, as though there was a sediment in the water which sticks to the foliage after drying. Do you think this spotting could come from the action of the water on the zinc? What kind of paint or varnish could I use to coat the zinc, which would have no effect on the water? The tank was built and lined about two years ago, and the zinc now shows a roughened surface. Before building the tank I used the same water, but did not notice any stain. The water is changed about once in three or four days. Tank holds about twelve hundred gallons. A. It is probable that the zinc is the cause of the spotting. Painting the inside of the tank with red oxide of iron and boiled linseed oil will no doubt be a remedy. The oxide of iron is called in trade "Prince's metallic paint." You can mix it yourself. Make it as thick as can be spread easily with a brush. Use no turpentine.

(28) W. F. H. asks: Can you inform me how the cement is made which gas fitters use on joints after they are put together and found to leak slightly? It is not the regular red lead and oil I have reference to, but a hard cement which looks like red sealing wax. A. This is called gas fitters' cement. Melt together 4½ parts resin (by weight), 1 part beeswax, then stir in 3 parts Venetian red and pour into moulds made of oiled paper or cold iron moulds.

(29) J. E. E. asks: Does sound travel a greater distance north and south and more rapidly than it does east and west, wind currents being equal? And if so, have electrical currents anything to do with it? A. Experiments upon the velocity and conditions of sound in the atmosphere during the past 150 years have not developed any difference in the velocity or distance of sound as regards the points of the compass. There is a decided difference in velocity and distance, as with or against the wind, as well also with the temperature and humidity of the atmosphere. The velocity increases with the temperature at the rate of 1·14 feet for each degree above 32° Fahr. The velocity assigned at 32° in dry air is 1089 feet per second, and at 62° 1125 feet per second. There are no experiments known to us in regard to the velocity of sound in different electrical conditions of the atmosphere. We think the electrical influence is imperceptible.

(30) E. G. C. asks regarding the modern method of rendering glass articles iridescent. A. Some information is given in regard to the process as practiced abroad on page 1800 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 113. It is also said to be produced by volatilising tin chloride in the furnace.

(31) N. S. H. asks: 1. For receipts for mucilage and glue combined, called Egyptian Tenexine? A. We are not familiar with the composition of the article mentioned. 2. How is impression paper made? A. Take some thin post or tissue paper, rub the surface well with black lead, vermilion, red chalk, or any coloring matter; wipe this preparation well off with a piece of clean rag, and it will be ready for use. 3. How are luminous match safes made? A. See "How to make luminous paint," SCIENTIFIC AMERICAN SUPPLEMENT, No. 249. 4. What are pocket lights made of? A. See "Fire work formulæ," SCIENTIFIC AMERICAN for July 16, 1881, page 42.

(32) R. H. H. asks: What is the best thing to clean buckskin mittens, and also what will clean a bronze plate lamp hanger? A. The following, which is used to clean chamois skins, will probably be satisfactory: Make a solution of weak soda and warm water, rub plenty of softsoap in to the leather, and let remain in soak for two hours, then rub well until quite clean. Rinse well in a weak solution of soda and yellow soap in warm water, but *not* in water only, else it dries hard. After rinsing, wring it well in a rough towel and dry quickly, then pull it about and crush it well until soft. Cleansing with naphtha will perhaps answer. For the bronze plate, if real, use oxalic acid; if imitation, soap and water will answer.

(33) A. W. B. asks: 1. If borax renders shellac soluble in water, will not the compound after being used as varnish or cement be then soluble and easily injured by being washed, etc.? A. Yes; although as it dries up it is less likely to be dissolved off. 2. If shellac is dissolved in spirits, camphor or other resinous gum may be added to give the varnish a gloss or luster. Can anything be added to produce this effect when water is used as a solvent? A. We would suggest the use of gum arabic for the purpose.

(34) J. J. D. asks: How sulphocyanide of ammonia is prepared? A. This salt may be prepared by mixing hydrocyanic (prussic) acid with ammonium polysulphide (a solution of sulphur in ammonium sulphide), and separating the resulting ammonium sulphocyanide from the precipitated sulphur by filtering. The salt thus produced is in solution, and may then be obtained in the dry state by evaporation to crystallization. In any case it is cheaper and preferable to purchase the sulphocyanide from a wholesale druggist or dealer in chemicals.

(35) D. P. S. asks: Will you tell me through Notes and Queries why it is that certain salts or acids when dissolved or mixed with water produce heat, while others produce cold? A. Bodies having a great chemical affinity for each other produce heat when brought together, while such bodies as have but little chemical affinity produce cold, as the heat is rendered latent by liquefaction.

(36) E. K. B. writes: 1. Will you please give me the candle power of the calcium light, say the light used by Mr. Stoddard in throwing his pictures upon the screen? A. From 100 to 125 candle power. 2. What are the limes used made of, and how? A. The best lime cylinders are made of calcined marble; but they are usually cut out of selected pieces of common unslaked lime, which answers very well.

(37) S. J. D. asks: 1. What power is exerted by a screw one-eighth pitch, 1 in. diameter. Pointed angle of 30° working between 2 pins, angle to suit screw; in other words, what weight will they lift? A. What is the length of your lever working the screw, and what pressure do you apply to the end of the lever? 2. What is correct method of finding the pressure on a slide valve? A. There is great difference of opinion as to the *correct* method—some say it is only that due to the area of all the openings; others that it is that due to the whole surface of the valve when not moving, but less the area of one port when working.

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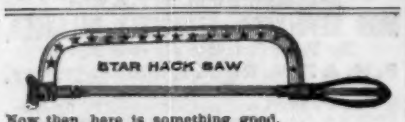

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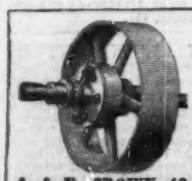

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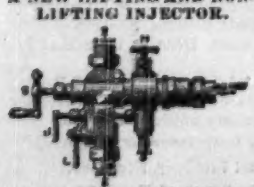

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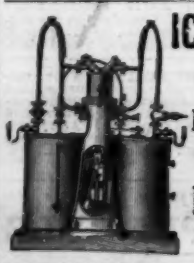

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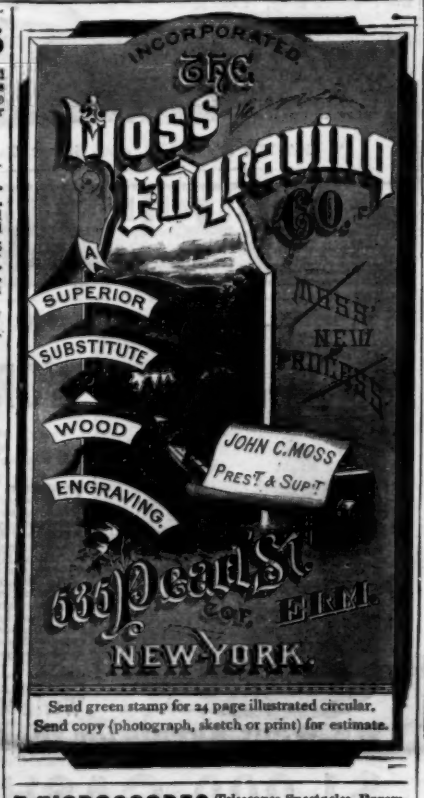

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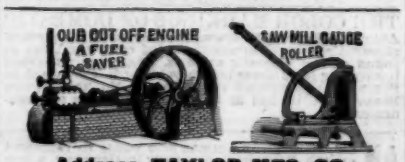

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